FINAL

SUMMARY OF FORT DES MOINES INVESTIGATION AND EVALUATION OF CLOSURE ACTIVITIES

Prepared for:



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ACRONYMS

ACM Asbestos-Containing Material AEC Army Environmental Center

ARAR Applicable or Relevant and Appropriate Requirements

bgs Below Ground Surface

BRAC Base Realignment and Closure

BRACO Base Realignment and Closure Office

CERCLA Comprehensive Environmental Response Compensation and Liability Act

DoD Department of Defense

EBS Environmental Baseline Survey

EE/CA Engineering Evaluation/Cost Analysis

EI Environmental Investigation

EI/RA/AA Environmental Investigation/Risk Assessment/Alternatives Analysis

EPA U.S. Environmental Protection Agency

FDM Fort Des Moines

FOST Finding of Suitability to Transfer FUDS Formerly Utilized Defense Site

HTRW Hazardous, Toxic, and Radioactive Waste

HUD Housing and Urban Development

IDNR Iowa Department of Natural Resources

JMWA J.M. Waller and Associates, Inc.

K Hydraulic Conductivity

LBP Lead-Based Paint

LTM Long-Term Monitoring

MCL Maximum Contaminant Level

ND Non-Detect

OHM Remediation Services Corp.

PA Preliminary Assessment
PCB Polychlorinated Bi-phenyl
pCi/L Pico-Curies per Liter

RCRA Resource Conservation Recovery Act

RBC Risk-Based Concentration

SI Site Investigation

SVOC Semi-Volatile Organic Compound TPH Total Petroleum Hydrocarbons USACE U.S. Army Corps of Engineers

USGS U.S. Geological Survey

Versar Versar, Inc.

VOC Volatile Organic Compounds

ug/L Micrograms per Liter



EXECUTIVE SUMMARY

This document provides a review and summary of existing site conditions, previous investigations, and remediation activities that have taken place at Fort Des Moines (FDM). Although the majority of this report focuses on the groundwater, soil contamination and other Areas of Concern (AOC) are also included in this report. The report includes information related to investigations on both the Base Realignment and Closure (BRAC) property and the Formerly Utilized Defense Site (FUDS) properties. Also presented are recommendations for activities in order to attain closure at FDM.

A series of environmental investigations have taken place at FDM since 1988. Between November 1990 and March 1993, an Environmental Investigation/ Risk Assessment/ Alternatives Analysis (EI/RA/AA) was conducted by VERSAR as part of the site investigation process. This study identified eight areas of environmental concern associated with FDM. The AOCs included: Building 138, Unrestricted Disposal Area 1, Underground Storage Tanks (USTs), polychlorinated biphenyl (PCB) Transformers, Small Arms Range Bullet Traps, Stored Chemicals, Soil at Buildings 67 and 138, and the surficial water-bearing zone. With the exception of groundwater, all of these AOCs have been addressed by remediation efforts by OHM Remediation Services and Cape Environmental Management.

Groundwater monitoring data was collected from March 1991 through February 1993 by Versar, Inc. (Versar); June 1996 through June 1997 by OHM Remediation Services Corp. (OHM); August 1996 by USACE-Omaha; and December 1999 through August 2000 by Cape Environmental Management. Based on the frequency and consistency of their detection, tetrachloroethene (PCE) and trichloroethene (TCE) are considered the Volatile Organic Compounds (VOCs) that are Contaminants of Concern (COCs) for groundwater. VOCs have decreased significantly at all locations but remain above Maximum Contaminant Levels (MCLs) at some source locations, such as MW-17. Alpha-BHC, beta-BHC, and delta-BHC are considered the pesticides of concern for groundwater. These contaminants have decreased significantly at some locations and only slightly at others, which is expected given their resistance to biodegradation and their low water solubility.

This document evaluated three potential groundwater alternatives including: one time sampling followed by well closure, long term monitoring, and groundwater treatment. Groundwater treatment was ruled out because a pump and treat scenario is not likely to be technically feasible due to the low yield characteristics of the shallow groundwater. Long term groundwater monitoring was ruled out because the shallow groundwater zone beneath the site is not a usable resource and collecting data for an extended time period would add little or no value to the program.

The preferred alternative consists of a one time sampling event followed by closure of the monitoring wells. The additional sampling event would consist of sampling nine existing wells. These nine wells should be analyzed for the groups of contaminants identified above, namely VOCs and pesticides. Well closure will begin after the sampling results





are received from the laboratory and after approval to close the wells is obtained from the lowa Department of Natural Resources (IDNR). This activity would involve the closure of all 29 monitoring wells (both BRAC and FUDS wells). Based on preliminary conversations with EPA and Iowa, FDM is not considered a high priority site. Furthermore, local ordinances prohibit the use of groundwater for residential purposes. As there is no identifiable exposure pathway between groundwater and human or environmental receptors, strict application of groundwater MCLs is not necessary.



J.M. Waller Associates, Inc. (JMWA) was awarded a contract to plug and abandon 23 monitoring wells at the Fort Des Moines (FDM) site. In preparing to close these monitoring wells, JMWA personnel discovered that the groundwater at FDM may still contain concentrations of contaminants in excess of state and federal groundwater standards. Also, neither the Iowa Department of Natural Resources (IDNR), nor EPA Region VII officials had formally approved the Army's remediation efforts. The regulator's historical involvement in efforts related to monitoring well installation, sampling efforts, and well abandonment were not sufficiently documented to guarantee the Army's protection.

JMWA recommended to Base Realignment and Closure Office [BRACO (formerly FORSCOM)] in a December 19, 2001 meeting in Des Moines, Iowa that a more thorough review of the historical investigations, remediation efforts, and the current disposition of FDM be completed prior to performing any monitoring well abandonment. A formal presentation of the data to the regulators was also anticipated. BRACO agreed with these recommendations and JMWA subsequently visited the U.S. Army Environmental Center (AEC), U.S. Army Corps of Engineers (USACE)-Omaha, and Fort McCoy to obtain information pertinent to FDM investigations. JMWA also contacted IDNR, and EPA Region VII officials.

This report provides a synopsis of the existing site conditions and details previous investigations and remedial actions that have taken place. Although the majority of this report focuses on the groundwater medium, soil contamination and other Areas of Concern were also summarized and included in this report. The report includes information related to investigations on both the Base Realignment and Closure Office (BRACO) side of the property and the Formerly Utilized Defense Site (FUDS) portion as well. Also presented are formal decisions regarding BRACO's final response to property transferals on both the BRAC and FUDS properties.

Based on the historical information and data collected, JMWA evaluated the potentially significant data gaps. Data gaps are analytical data or important environmental activities for which JMWA has been unable to locate empirical or legally sufficient data or documentation. These include missing documentation of regulatory involvement, missing documentation describing why certain sampling events have been skipped, and missing administrative correspondence.

Finally, based on the information collected and conversations with IDNR and EPA, JMWA has provided recommendations and conclusions for consideration by BRACO. Appendices have been included to provide supplemental information, including sampling results, boring logs, risk calculations, and cost estimates.





2.0 SITE BACKGROUND AND PHYSICAL CHARACTERISTICS

This section presents an overview of the FDM property on both the BRAC and FUDS portions of the property. It includes a site description, site history, and a summary of environmental evaluations performed on the BRAC and FUDS properties as identified in previous investigations.

2.1 Site Description

The excised BRAC parcel consists of 53.28 acres of FDM and represents the major portion of a former U.S. Army cavalry post that was originally established on 640 aces of land donated in 1903. The FUDS parcel was previously excised as part of property transfers that have totaled approximately 557 acres. All of the excised property is now used for commercial, residential, and recreational purposes. A 30.02-acre parcel of the installation is still occupied and used by the U.S. Army Reserve Center.

FDM is situated within the Des Moines city limits in southern Polk County, Iowa (Figure 2-1). FDM is located one mile east of the Des Moines Municipal Airport along the south side of Army Post Road. The site location coordinates are NE 1/4, Section 33, T78N, R24N, of the Des Moines SE, Iowa, 7.5-Minute United States Geological Survey (USGS) Topographic Quadrangle Map (1976). The Universal Transverse Mercator (UTM) central site coordinates are 93° 37′ 9″ west longitude, 41° 31′ 12″ north latitude.

Both the BRAC and FUDS parcels of FDM are bordered to the north by a commercial/residential area and to the south by the Blank Park Zoo. The BRAC property is bordered on the east by Fort Des Moines Park and the active U.S. Army Reserve Center and on the west by FUDS property, which is now Blank Park. The FUDS parcel is bounded by 9th Street to the west and the BRAC property to the east. Figure 2-2 illustrates some of the neighboring properties, and the layout of the buildings at FDM. Figure 2-3 shows the current property owners of the FDM parcels and the BRAC and FUDS property boundaries.

2.2 Site History

FDM was used throughout much of its early history as a training camp. Because it served as the first training facility for black officers in the U.S. Army and was used as a training center for the Women's Army Auxiliary Corps in 1942, it is listed on the National Register of Historic Places. Barracks, stables, and warehouses constructed prior to 1917 are considered to be structures contributing to the overall historical nature of the installation, and are afforded special protection with respect to demolition and the extent of alterations and repairs that may be performed. Buildings constructed after 1917 are considered noncontributing and are not subject to special restrictions associated with historic preservation. Of the 33 structures included in the 53.28 acre study area, 27 buildings are considered contributing structures subject to special protection (National Register of Historic Places Inventory- Nomination Form, 1973).

The most environmentally significant tenant operation during the history of FDM was the leasing of Buildings 67 and 138 to Barco Chemical Company for pesticide blending from



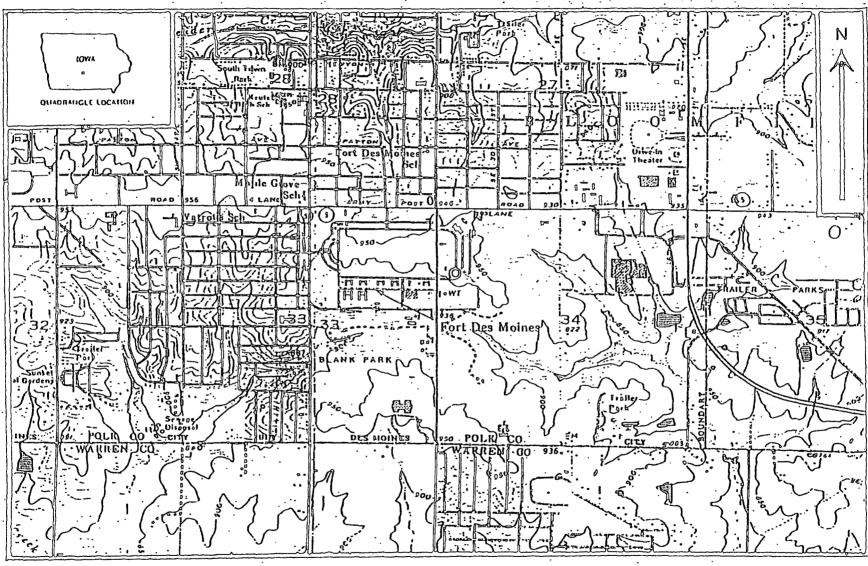
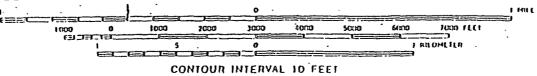
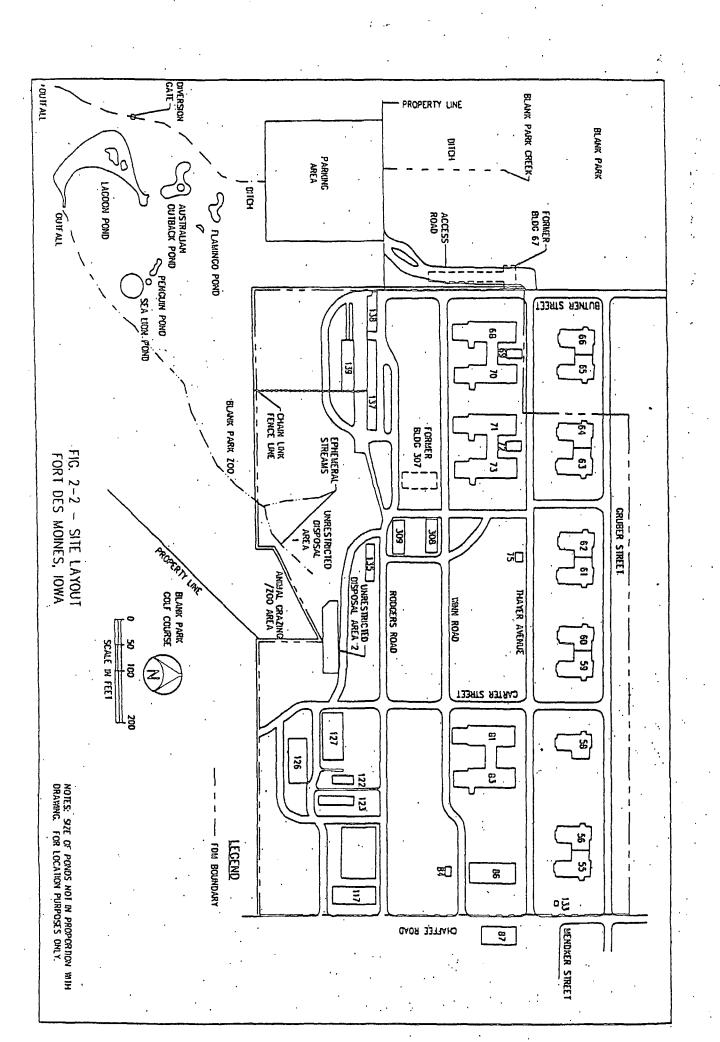
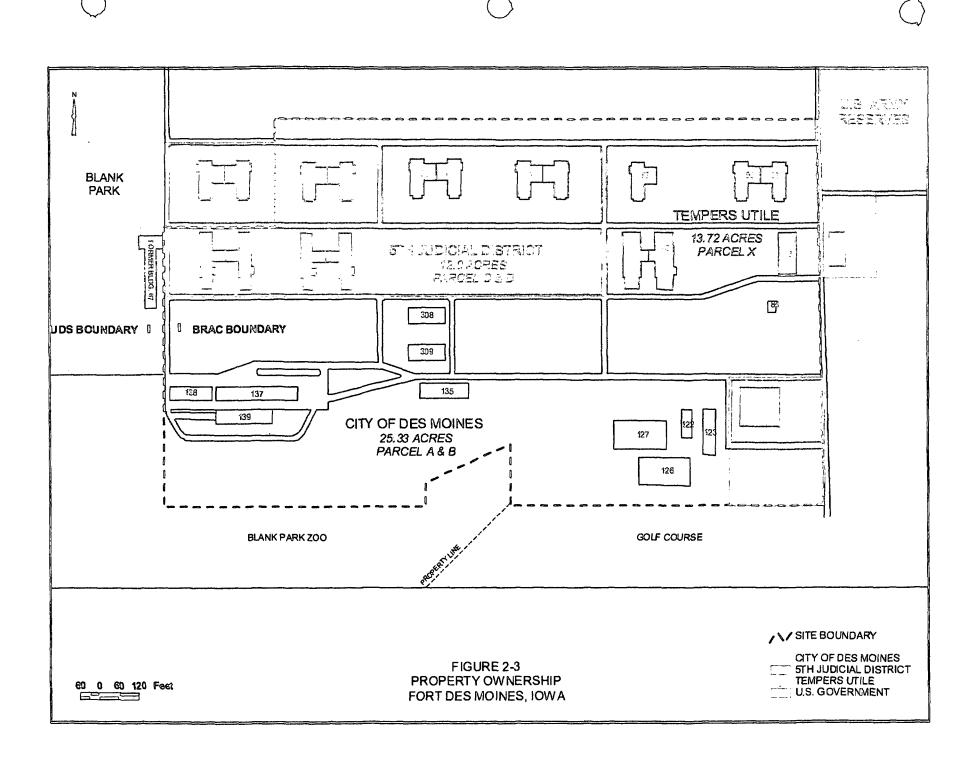


FIGURE 2-1. SITE LOCATION. REFERENCE: DES MOINES, SE AND SW, IOWA QUADRANGLE, 1976.



DOTTED LINES REPRESENT S-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929







1950 to 1959. Building 67 has since been demolished. Detailed background information was limited regarding the exact operations that were performed on-site by Barco Chemical Company and the type of raw materials that were utilized.

2.3 Environmental Investigations and List of Documents

The following list identifies the documentation that JMWA reviewed in order to develop this report. It provides a general timeline and history of the investigative and remedial activities that have take place at FDM since the late 1980's.

- In 1989, Roy F. Weston, Inc prepared an enhanced Preliminary Assessment (PA) report. Weston's objectives were to: identify and characterize environmentally significant operations associated with the historical and current use of the FDM property; identify and characterize possible impacts of these operations on the surrounding environment; and identify additional investigations necessary to characterize significant areas.
- Following the enhanced PA, USAEC contracted ICF Technologies, Inc., to prepare a Technical Plan to conduct an Environmental Investigation (EI).
- Between 1990 and 1993 Versar conducted field activities that identified and characterized the site and led to preparation of the EI/RA/AA document, which was finalized in 1995.
- OHM was awarded a Rapid Response contract by USACE-Omaha in 1995. For this effort, OHM decontaminated Building 138 and excavated pesticide contaminated soils and sewer line sections between Buildings 67 and 138 on the BRAC property. OHM also performed a chemical sweep of FDM, PCB contaminated transformer disposal, and bullet trap removal. Waste produced from previous investigations was also disposed of under this effort.
- USACE-Omaha developed an Environmental Baseline Survey (EBS) for FDM in November 1995. The EBS detailed site conditions on the BRAC property that were current as of November 1995.
- o In 1995, the Army released a Proposed Plan as part of its public participation responsibilities under Comprehensive Environmental Response Compensation and Liability Act (CERCLA). The plan identified the preferred alternative for cleaning up areas of environmental concern at FDM (BRAC side). The preferred alternative was soil removal at hot spots and long term groundwater monitoring.
- o OHM was contracted in 1997 to put together an interpretation of data that summarized sampling data from March 1991 through June 1997.
- A Finding of Suitability to Transfer (FOST) was prepared for the BRAC parcel with the highest historical contamination in September 1997. This portion of the BRAC parcel dealt significantly with soil and groundwater contamination inside and in the general vicinity of Building 138. Other concerns were noted as well. The document closely resembled the EBS prepared in 1995.
- USACE-Omaha conducted a Site Investigation (SI) in 1997 on the FUDS property. The investigation was focused primarily on former Building 67 and the sewer pipeline corridor that ran to Building 138 on the BRAC property. This investigation was undertaken as a result of the BRAC property investigations.







- A quitclaim deed was signed in 1997 that identified property "formerly owned by the United States of America, but now owned by the City of Des Moines", which is the FUDS property. This deed was entered into by USACE-Omaha and the City of Des Moines for the purposes of allowing the Army and its representatives access to the property for the purpose of installing and/or removing groundwater monitoring wells, and to perform continued monitoring of groundwater conditions.
- In 1999, USACE-Omaha developed an Engineering Evaluation/Cost Analysis (EE/CA) to detail FUDS property contamination and outline cleanup alternatives.
- A Decision Document was released in 1999 that identified the alternative the Army had decided to take in relation to cleanup of contaminated soils and groundwater on the FUDS property.
- Cape Environmental Management submitted a Chemical Data Final Report in June 2001, which summarized quality control practices and analytical results of pesticide-contaminated soil excavation and one year of quarterly groundwater sampling on the FUDS property.

2.4 BRAC Property

Versar was contracted by USACE-Omaha to conduct the EI/RA/AA. Versar prepared a Project Plan in September 1990 and performed the Phase I field activities in late 1990 and early 1991. Additional field activities were conducted in late 1991 (Phase II), early 1992 (Phase III), and early 1993 (Phase IV) to fully evaluate the presence of contaminants in the groundwater and soil, and to evaluate the possible off-site migration of contaminated groundwater and surface water from the southwest portion of the FDM property.

The Versar investigations concluded that risks were found to be above the acceptable risk range for dust exposure in Building 138, surface soils in the vicinity of Building 138, and shallow groundwater from the entire site.

In 1995, OHM was awarded a contract to remediate Building 138 and its contents, excavate contaminated soils south of Building 138, remove a contaminated sewer line and ancillary soils between Building 138 and former Building 67, remove pole-mounted transformers, perform a chemical sweep of FDM, remediate three bullet traps, and remove investigative derived wastes generated during previous studies. All of these tasks were completed including the removal of approximately 288 cubic yards of excavated soil near building 138.

In 1997, a FOST was prepared for the excise of 25.33 acres to the City of Des Moines. This parcel constituted the last parcel of BRAC property at FDM that was to be transferred and included that portion of FDM that was found to have environmental contamination.





2.5 FUDS Property

An Inventory Project Report, prepared in 1992, recommended a Hazardous Toxic and Radioactive Waste (HTRW) project to investigate soils, groundwater, surface water, and air for any possible environmental concerns due to former DoD activities. During 1996 and 1997, the USACE-Omaha conducted a Site Inspection for Former Building 67, which recommended No Further Action on the majority of the property. However, the investigation also revealed that the soils surrounding former Building 67 showed elevated levels of pesticide contamination. As mentioned previously, Building 67 had housed pesticide blending activities in the 1950 to 1959 timeframe. Former Building 67, which had been previously demolished, was adjacent to the current location of a parking lot for the Blank Park Zoo. The City was planning to expand the zoo parking areas to encroach upon the location of former Building 67. Due to the high degree of public access and recreation on the property; and coupled with the fact that the city had plans to construct a parking lot on the area of concern, immediate action was necessary.

During 1998 and 1999, the Omaha District Corps of Engineers performed an in-house EE/CA concerning the pesticide issue at Building 67. The EE/CA report outlined the extent of the contamination and the risks involved with each of the pathways, and analyzed several possible alternative methods of remediating the problem. In 1999, an Action Memorandum (Decision Document) was prepared by USACE-Omaha for the cleanup and remediation of FUDS property at FDM.



The Omaha District awarded a contract in June 1999 to Cape Environmental Management to perform the remediation. The construction began and was completed in the fall of 1999 and the closure report was submitted in early 2000. No written concurrence from the state has been found to suggest that IDNR either approved or rejected the site closure.





AREAS OF CONCERN AND SELECTED ALTERNATIVES

A series of environmental investigations have taken place at FDM since 1988. Between November 1990 and March 1993, an EI/RA/AA was conducted as part of the base closure process. This study identified 12 areas of environmental concern associated with FDM. An Environmental Baseline Survey, a Finding of Suitability to Transfer, and two Army Decision Documents (one for the BRAC property and one for the FUDS property) have outlined measures that the Army decided to take in order to address concerns identified in previous investigations. The AOCs and the Army's selected alternatives are listed below and Table 3-1 provides the information in a compressed format.

AOC: Groundwater under BRAC Property- Volatile organic compounds (VOCs) and pesticides at or above Applicable or Relevant and Appropriate Requirements (ARARs) were detected in the shallow water-bearing zone near Building 138 and former Building 67 (Versar EI/RA/AA, 1995). The presence of these contaminants was associated with historic pesticide and herbicide blending activities that took place at the two buildings. The primary source of the contamination was the storm sewer line that ran between Buildings 67 and 138.

Selected Alternative - On the BRAC side of the property, the sewer line and contaminated soils were removed until concentrations of contaminants were at or below health-based standards identified in the Removal Action Memorandum dated July 7, 1995. Versar installed 23 monitoring wells at various locations on FDM property and sampled these wells on five occasions. OHM also performed quarterly sampling for one year on the monitoring wells between June 1996 and June 1997. At the time of property transfer, the Army decided to implement Long Term Monitoring (LTM) for groundwater for 30 years as part of their Proposed Plan (U.S. Army Announces Proposed Cleanup Plan for Fort Des Moines, Iowa, 1995).

AQC: Groundwater under FUDS Property – Based on information gathered during investigations on the BRAC property as detailed above, at total of six additional monitoring wells were installed on the FUDS property between 1996 and 1999 to further delineate groundwater contamination in and around former Building 67. <u>Selected Alternative</u> – In response to groundwater issues on the FUDS property, an alternative was chosen which required the implementation of a LTM program [Decision Document (Action Memorandum) FUDS, Old Fort Des Moines, Former Building 67 Site]. In addition to the newly installed monitoring wells, several existing monitoring wells (previously installed as part of the BRAC investigations) were sampled. These were monitoring wells MW-17, MW-18, MW-19D, MW-19S, MW-21, MW96-1, and MW96-2. The Army's decision was to sample these wells quarterly for two years in order to establish a baseline. Semiannual sampling was scheduled for the next three years and annual sampling for the subsequent 15 years.







AOC: Building 138 – Pesticides and herbicides were present throughout the interior of this building (primarily in the basement) as the result of historic pesticide and herbicide blending activities conducted between 1951 and 1959.

<u>Selected Alternative</u> - The building has been decontaminated. Gross dust and debris was removed and followed with a pressure wash. Oily materials in the elevator shaft were removed and the elevator shaft was decontaminated. USACE-Omaha confirmed that the building is decontaminated and suitable for its intended use in accordance with the Removal Action Memorandum dated July 7, 1995.

AOC: Soil – Pesticides have been detected in soil samples collected around and between Buildings 67 and 138 during both BRAC and FUDS investigations. The highest concentrations occurred in a "hot spot", located just to the south of Building 138. In addition, soil samples collected between the two buildings and near MW-1, contained elevated levels of pesticides, VOCs, and low levels of dioxin.

Selected Alternative - The Army excavated and removed contaminated soils associated with the "hot spot", and the sewer line between the site of Building 67 (demolished) and Building 138. Soils that were within the footprint of former Building 67 were excavated as well. Soils were removed until concentrations of contaminants were at or below health-based standards. These standards were based on cleanup levels for residential risk scenarios and were taken from the Federal Register, Volume 55, No. 145, Proposed Rules, Appendices A and C. Soils containing pesticides and dioxin were disposed of in accordance with Resource Conservation Recovery Act (RCRA) requirements. The excavations were backfilled with clean soil and regraded.

AOC: Unrestricted Disposal Area 1– Uncontrolled dumping of tires, furniture, appliances, and bulk residential-type items occurred here in the past. No evidence was found to indicate that chemical disposal had occurred in this area. Selected Alternative - In 1995, under direction of the USACE, Omaha District, waste debris (tires, furniture, appliances, and bulk residential-type items) was removed and the area regraded and stabilized. The drainage ditch was lined with large stones and gravel to prevent soil erosion.

AOC: Unrestricted Disposal Area 2 – Historical evidence suggested disposal of utility poles and pallets at this site. Testing indicated the presence of semi-volatiles in the range of 0.46 to 2.49 parts per million (ppm), total petroleum hydrocarbons (TPH) with concentrations between 22.9 and 249 ppm, and a single low-level pesticide detection of 0.0183 ppm for DDT.

<u>Selected Alternative</u> – All contaminants were evaluated in the VERSAR risk assessment, which concluded that the risk posed by the site fell within an acceptable range for its intended use, which is storage and support of adjoining recreational facilities.

AOC: Underground Storage Tanks (USTs) – The facility-wide EI survey reported eight underground storage tanks near buildings at FDM. The tanks were formerly used for the storage of gasoline, diesel, fuel oil, and waste oil.

<u>Selected Alternative</u> - Four USTs known to be associated with Buildings 127 and 139 were removed – two in 1990 and two in 1995. Three USTs in the vicinity of buildings 83





and 86 were removed in 1995 and Building 117 had an UST removed in 1992. During the site remedial work in 1995, one suspected UST near Building 122 was determined to not exist. As of the time of this report, all USTs known to exist at FDM have been removed or their absence documented.

<u>AOC: PCB Transformers</u> – Thirty-three transformers at 19 on-site locations were evaluated for the presence of PCBs. Five of the 33 transformer were found to be "PCB containing" because they contain PCBs at concentrations greater than 500 parts per million (ppm). Eight transformers were found to be "PCB-contaminated" because they contained PCBs at concentrations between 50 and 500 ppm.

<u>Selected Alternative</u> - Under the direction of USACE-Omaha, the transformers were removed in phases from the property over a period extending from 1993 to 1995. All PCB-contaminated transformers throughout the FDM site, including those on the property proposed for transfer to the City of Des Moines were removed.

AOC: Small Arms Range Bullet Trap – Buildings 56, 58, and 81 contained indoor small arms firing ranges equipped with sand pits to collect spent ammunition. As a result, the sand pits contain elevated levels of several metals, primarily lead. It is estimated that approximately 12 cubic yards of sand within these buildings would require removal and disposal.

<u>Selected Alternative</u> – Sand and pea gravel bedding material used in the small arms range bullet traps in Buildings 56, 58, and 81 was removed and placed in lined and tarped roll-off boxes for disposal in 1996.

AOC: Stored Inventory of Chemicals – Small quantities of chemical materials were stored at various locations throughout FDM. These materials include old paint and lubricants, miscellaneous petroleum products, etc.

<u>Selected Alternative Selected Alternative</u>—In June 1995, the Corps of Engineers directed the removal of all stored chemicals within the buildings. Approximately 1,650 gallons of stored materials were removed and disposed.

AOC: Radon – A facility-wide radon evaluation was conducted as part of the environmental investigation. All but two buildings (63 and 72) showed less radon than the EPA guidance level of 4.0 picocuries per liter (pCi/L).

<u>Selected Alternative</u> - Upon property transfer(s) and prior to beneficial occupancy of the facilities, the transferee agreed to assume responsibility for any necessary mitigation and management of radon gas in accordance with applicable Federal, state, and local laws and regulations. Transferees were permitted access to a radon evaluation conducted as part of the EI.

AOC: Asbestos-containing Materials (ACM) — Asbestos sampling was conducted in every building with the exception of Building 138, which was not sampled because of both structural hazards and the presence of pesticides. The ACMs detected included both friable materials (i.e., breaks readily apart in your hand), such as pipe insulation and elbows and boiler tank insulation, and non-friable materials, such as floor tile/linoleum, and transite panels.



<u>Selected Alternative</u> - Upon property transfer(s) and prior to beneficial occupancy of the facilities, the transferee agreed to assume responsibility for any necessary mitigation and management of asbestos in accordance with applicable Federal, state, and local laws and regulations. The Army acknowledged the presence of both friable and non-friable asbestos on the property. Transferees were permitted access to an asbestos survey that was conducted.

AOC: Lead-based paint (LBP) – Facility-wide sampling indicated that the majority of the composite building samples exceeded the lead guidance level of 0.5 percent by weight set by the U.S. Department of Housing and Urban Development (HUD). Because of the sampling results and the age of the on-site building, all structures were assumed to have some LBP present.

<u>Selected Alternative</u> - In accordance with Department of Defense (DoD) policy on LBP at BRAC properties, abatement of LBP hazards are not required of buildings scheduled for non-residential use. Where the residential use of buildings is proposed, the transferee is to assume that LBP resides on all painted surfaces. Upon transfer and prior to beneficial occupancy of the facility, the transferee agreed to assume the responsibility for abatement of any LBP surfaces in accordance with applicable Federal, state, and local laws and regulations.

AOC: Blank Park Creek Sediments – Pesticides and a limited number of metals were detected in sediment samples collected from Blank Park Creek, which is located west of the current FDM boundary. This creek is an ephemeral stream that receives storm water runoff from not only the current FDM, but also from nearby roadways and properties to the north and west. The study results suggested that numerous nearby off-site, non-point sources may be substantial contributors for the contaminants detected in the stream. The potential on-site contributing contaminant sources (e.g., the storm sewer line between Buildings 67 and 138) for the constituents detected in the creek were identified in the EI/RA/AA Report.

<u>Selected Alternative</u> – Environmental reports confirm and JMWA believes that the cleanup of identified on-site sources (e.g. excavation and removal of the storm sewer line and hot spots near building 138), as discussed in the OHM Rapid Response Report, adequately addressed this particular area of concern as it relates to the current FDM. Therefore, this area of concern was not specifically identified in other cleanup alternatives.

Table 3-1
Areas of Concern and Selected Alternatives

AOC	Selected Alternative				
Groundwater Contamination	Long-Term Monitoring				
Pesticide/Herbicide Contamination of the Interior of Bldg. 138	Decontamination				
Pesticide Contaminated Soils	Excavation and Disposal of Contaminated Soils				
Unrestricted Disposal Area 1	Removal of Large Debris and Regrade				
Unrestricted Disposal Area 2	No Action (NA)				
Underground Storage Tanks	Removal				
PCB Transformers	Removal				





Small Arms Range Bullet Traps	Sand and Pca Gravel Bedding Material Removed				
Stored Inventory of Chemicals	Removal				
Radon	Transferee License Agreement				
Asbestos Containing Material	Transferee License Agreement				
Lead-Based Paint	Transferee License Agreement				
Blank Park Creek Sediments	NA				

3.1 Ongoing Groundwater Contamination Concerns

In September 2001, JMWA was retained to close the 23 monitoring wells installed during historical investigations at FDM. However, closure of these monitoring wells was inconsistent with the Army's previously selected alternative and the latest available sampling results showed contamination above Maximum Contaminant Levels (MCLs). In consideration of these points and in an effort to clarify the current status of groundwater at FDM, JMWA reviewed the previous results of groundwater sampling efforts, interviewed regulatory officials both at IDNR and the EPA, and identified new conclusions and recommendations in an effort to (1) abbreviate or terminate LTM efforts and (2) and abandon the 23 groundwater monitoring wells in question. The results of JMWA's efforts to characterize previous groundwater sampling events and develop a clear path forward for well removal and closure can be found in Sections 5.0 through 7.0 of this report.





4.0 SOIL CHARACTERIZATION AND REMEDIATION

4.1 Soil Around Building 138

A summary of soil analytical results for the Building 138 can be found in Appendix A. Only one sample, SS-138-11, had detectable concentrations of VOCs, which were m-xylene (0.26 micrograms per gram (ug/g)) and toluene (0.37 ug/g). No PCBs were detected in any of the samples. Several pesticides were detected in the soil samples, with DDT and DDE present in all samples. Concentrations of DDE ranged from 0.0259 ug/g (SS138-14) to 4.46 ug/g (SS-138-5). Concentrations of DDT ranged from 0.0425 ug/g (SS138-14) to a value of 26.0 ug/g (SS138-2). Additionally, substantial concentrations of dieldrin (greater than 250 ug/g) and alpha-chlordane (68 ug/g) were detected in sample SS138-2. Other detected pesticides included: alpha-BHC, aldrin, alpha-endosulfan, beta-BHC, beta-endosulfan, dieldrin, endosulfan sulfate, heptachlor epoxide, lindane, methoxychlor, and DDD. The only herbicide detected was 2,4,5-TP, which was detected at 0.0252 ug/g in sample SS138-14.

A Review of the data showed that the highest overall concentrations of pesticides were detected in samples SS138-2, SS138-5, SS138-10, and SS138-11, all of which were collected within the grassy area south of Building 138. A comparison of the data between sample locations shows no uniform distribution in pesticide concentrations across the sampled area. However, the high values of dieldrin and chlordane in sample SS138-2 suggests the presence of a "hot spot" that may include adjacent samples SS138-4 and SS138-10. All locations where pesticides were detected were evaluated in the risk assessment.

Three of the surface soil samples suggested the presence of a "hot spot" due to dieldrin and chlordane residues. The carcinogenic risk estimates for future adult recreational and commercial workers ingesting Building 138 hot spot soils were 3.66×10^{-4} and 7.32×10^{-4} , respectively. Comparable risk estimates for Building 138 soils without the hot spots were 3.81×10^{-6} and 7.63×10^{-6} for adult recreational and commercial workers, respectively. For the inhalation exposure pathway for construction workers, the carcinogenic risk estimates were 2.46×10^{-4} and 2.40×10^{-6} , respectively. For future child recreational users, the soil ingestion carcinogenic risk estimates for the Building 138 hot spot and Building 138 without hot spot were 6.82×10^{-4} and 7.11×10^{-6} respectively.

Due to the elevated levels of pesticides located in the onsite soils and the potential for unacceptable risk, removal actions were undertaken in the vicinity of Building 138 during the fall of 1995 by OHM.

The action levels, provided by USACE, were based on cleanup levels for residential risk scenarios and are from the Federal Register, Volume 55, No. 145, Proposed Rules, Appendices A and C. These action levels are shown in Appendix A and correspond to a 1×10^{-6} risk to human health based on the residential use exposure. Excavated soils were placed in lined, covered 20 cubic yard rolloff boxes adjacent to the excavations.





Approximately 288 cubic yards of excavated soil were generated. The contaminated soils were disposed of off-site as either hazardous or non-hazardous in an approved landfill. The excavated areas were backfilled with clean material and seeded.

The EI/RA/AA performed by Versar indicated that a storm sewer line between former Building 67 and Building 138 was a potential source of contaminants to enter groundwater. For purposes of this discussion, the sewer line also includes contaminated soils adjacent to the sewer line. The Versar document recommended removal of the sewer line between former Building 67 and the manhole in front of Building 138. The overburden was removed down to the sewer line and sampled to verify attainment of action levels. The sewer line was located approximately four to five feet below grade. The sewer line was removed and placed in a hazardous waste rolloff box. The sewer line was very old and in poor condition and the joints between lengths of pipe were no longer sealed. As a guide to determine how much contaminated soil to excavate, it was necessary to establish action levels. Due to the depth of contamination below the ground surface, the action levels were based on the industrial exposure levels, which is based on a 10⁻⁴ risk of ingestion exposure to workers. These action levels are form the Federal Register, Volume 55, No. 145, Proposed Rules, Appendices A and C.

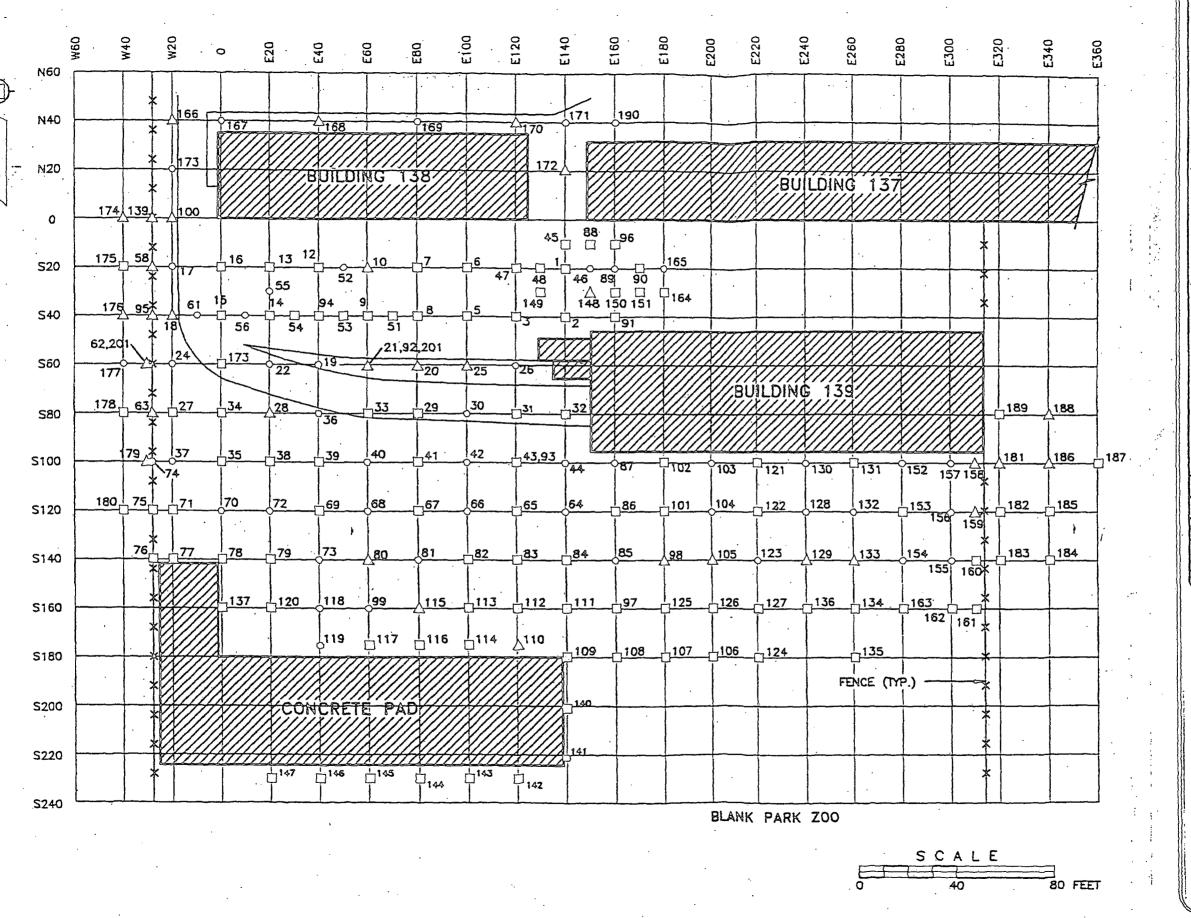
Excavated soils were segregated into soils containing herbicides and pesticides from soils containing pesticides only, because the RCRA hazardous waste codes triggered by the herbicides significantly affected the disposal costs. The excavated sewer line soils containing herbicides filled ten 20-cubic yard rolloffs. The excavated sewer line soils containing pesticides only filled four 20-cubic yard rolloffs.

Based on the above information and related documentation, it appears that the contaminated soils in the Building 138 and vicinity have been addressed by the removal action conducted by OHM. A cross check between the earlier sampling efforts conducted during the EI/RA/AA and those by OHM indicated that the areas of soil removal do correspond to those areas identified to exceed action levels during the initial characterization. Figure 4-1 shows the surface soil sampling locations used to identify hot spot areas that needed to be excavated. Figure 4-2 identifies the locations of the excavations and identifies where confirmation soil sampling was conducted. The results of these sampling events are shown in Appendix A. Also, due to the physical (low water solubility) and chemical (low partition coefficient) properties associated with pesticides, it is not expected that any residual pesticide contamination would migrate appreciably from the source areas. Therefore, we recommend that No Further Action is necessary for the soils in the vicinity of Building 138.

4.2 Soil Around Building 67

The source of soil contamination is believed to be related to operations during the use of Building 67 by Barco Chemical Company during their pesticide blending and bagging operations. In the 1995 Versar report, significant levels of pesticide contaminants were detected in the soil. Semi-volatile Organic Compounds (SVOCs) and herbicides were also detected in the soil. The primary soil contaminants at the former Building 67 site are





187 O INCONCLUSIVE FALED FIELD-SCREENING OUE TO INABILITY TO CORRELATE FIELD AND OFFSITE ANALYSIS

198 CONFIRMATION SOIL SAMPLE LOCATION UNDER ACTION LEVELS BY BOTH ON- AND OFF-SITE ANALYSIS

CONFIRMATION SOIL SAMPLE LOCATION IS ABOVE ACTION LEVEL CONFIRMED !
OFF—SITE AWALYSIS

MOTES

No.

- 1. ALL SAMPLE POINTS PREFIX = FS
- 2. SAMPLE POINTS 93 THROUGH 95 WERE TAKEN AT 18 INCH DEPTH.

Figure 4-1

Revision/Issue

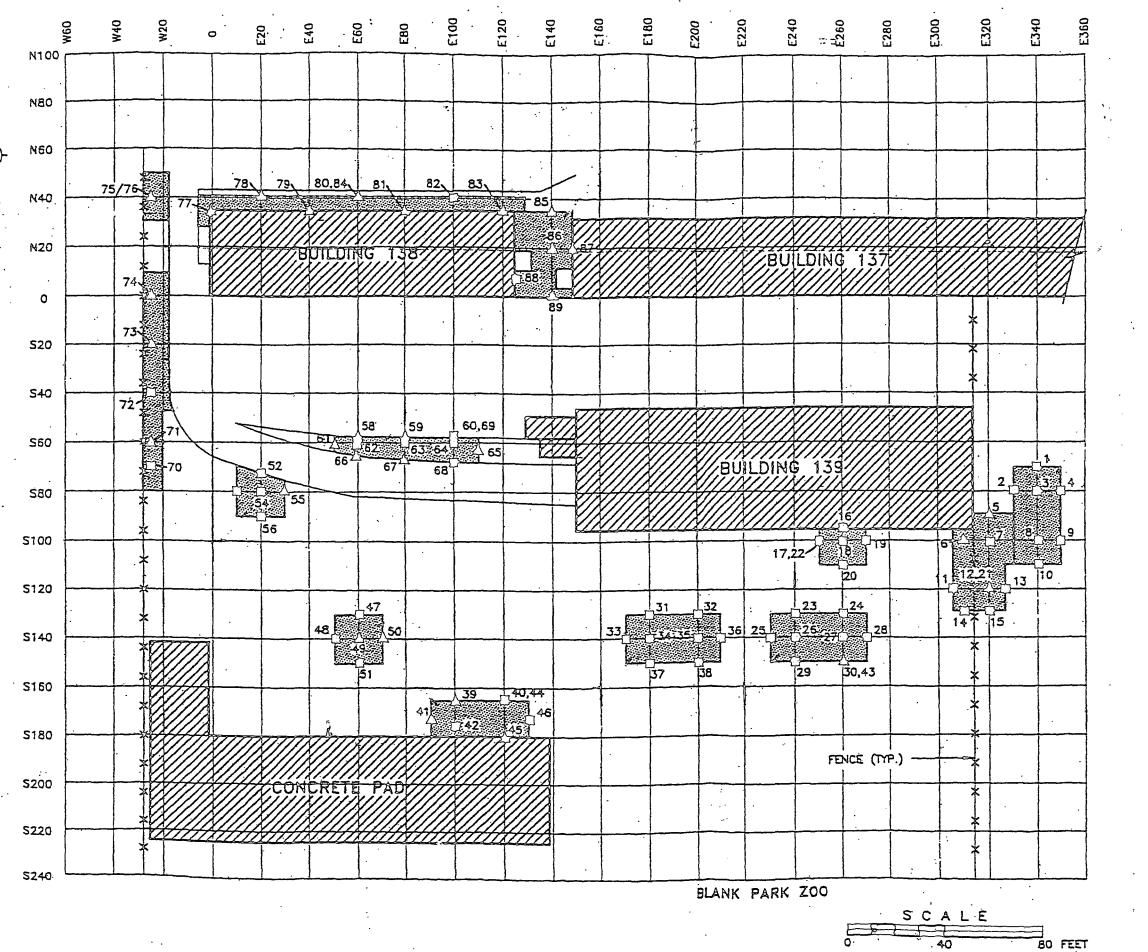
THIS DRAWING WAS ORIGINALLY PREPARE AS 16187—AS, EVALARCED SCALE, ADDED SAMPLE IDENTIFICATION.

LOCATIONS OF FIRST SAMPLING FORT DES MOINES DES MOINES, IOWA

PREPARED FOR

U.S. ARMY CORPS OF ENGI OMAHA, NEBRASKA

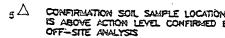




General Notes and Legend

LECEND:

4 Confirmation soil sauple location under action levels by both on-and off-site analysis





POST EXCAVATION AREA

MOTES:

No.

1. ALL SAMPLE POINTS PREFIX = CFS

Revision/Issue

This drawing was originally prepare as 16187—AB. Enlarged Scale. Added Sample identification.

Figure 4-2
SAMPLE LOCATIONS — POST EXI
FORT DES MOINES
DES MOINES, IOWA

PREPARED FOR

U.S. ARMY CORPS OF ENG OMAHA, NEBRASKA





pesticides and their by-products. Elevated concentrations of chlordane, dieldrin, DDD, DDE, DDT, alpha and beta-BHC were found at the former Building 67 site. The probable sources of these pesticides were the Building 67 interior drains and the exterior drain conduit left in place after the BRAC removal action.

In 1996, USACE-Omaha performed a soil sampling program in and around the location of the former Building 67 as part of a Site Investigation, in order to ascertain the nature and delineate the extent of contamination. Surface and subsurface soils were sampled for VOCs, SVOCs, PCBs, herbicides, pesticides, dioxins/furans and metals. While detectable levels of various metals, VOCs, SVOCs, and dioxin/furans were found in only a few samples, pesticides were found in nearly all samples with 7 pesticides in particular (DDT, DDD, DDE, Chlordane, Dieldrin, alpha & beta BHC), yielding concentrations exceeding the EPA Region III soil screening values.

The vertical distribution of pesticide-impacted soil varies across the site, with concentrations decreasing markedly with depth. Tetrachloroethene (PCE) was detected in both soil and groundwater during the 1996 SI. However, PCE concentrations in soil did not exceed the selected screening values. Soil results from the Versar 1995 EI/RA/AA and the USACE-Omaha 1996 SI are shown in Appendix A. These are results for samples that were collected prior to the remediation activities. Confirmation samples were collected after remediation activities were completed to verify that the unexcavated soils were below action levels.

Except for lead, Iowa has not established MCLs for contaminants in soil. Therefore an alternative remediation goal for this site was established for soil contamination. Risk-based cleanup levels are established to determine the extent to which contaminated soils should be removed. These contaminant-specific levels have been devised to be protective of human health and the environment. Contaminant concentrations in the Building 67 soils were screened against EPA Region III Industrial Risk-Based Concentrations (RBCs). Region III guidance was used because no guidance was published by Region VII (the EPA Region where this site is located) at the time of the removal action and because Region III values are thought to be conservative. These RBC values are shown in Appendix A.

Based on the limited data collected during both the 1995 Interim Remedial Action and the 1996 SI, the following conclusions can be made with respect to the nature and extent of soil at the Building 67 Site.

- The soil underneath and surrounding the footprint of former Building 67 is contaminated with varying concentrations of pesticides, and is a potential source of the observed groundwater contamination.
- Based on risk-based screening levels, the soil Contaminants of Concern (COCs) are Chlordane, Dieldrin, DDD, DDE, DDT, alpha-BHC, and beta-BHC.
- The abandoned storm sewer conduit is believed to be the major source of pesticide contamination.





The contamination is confined vertically within the top 20 feet of soil. Generally, contaminant concentrations are highest in the top two feet of soil, and decrease with depth and distance laterally away from the storm drain/building footprint.

In order to eliminate the potential threat to human health, an expedited cleanup of soils was recommended by a Decision Document prepared by the USACE-Omaha in June 1999. The components of the selected remedy included:

- Removal and disposal of the top four feet of soil, constituting a volume of approximately 1800 cubic yards, in an area bounding the foot print of the former building 67 and replacing the soil with certified clean fill and crushed rock.
- Installation of four monitoring wells for the purposes of monitoring migration of contaminated groundwater into locations downgradient of the site.

The USACE-Omaha awarded a contract in June 99 to Cape Environmental Management to perform the remediation. The construction began in early fall of 1999. The fieldwork was completed in the fall of that same year and the closure report was submitted in early 2000. An inspection by one of our JMWA employees in September 2002 revealed that a gravel parking lot now used by the Blank Park Zoo and Blank Park exists in the location of the former Building 67 site.

Based on the above information and related documentation, it appears that the contaminated soils within the footprint of former Building 67 have been addressed by the removal action conducted by Cape Environmental Management and No Further Action is required for soils.

Confirmation soil samples were collected following excavation in both the building 138 and former building 67 areas to verify that the remaining unexcavated soils were below the applicable action levels for this site, which were taken from the Federal Register, Vol. 55, No. 145, Proposed Rules. These confirmation sample locations and results are shown on tables and figures included in Appendix A. The action levels for surface soil were chosen based on a resident's potential exposure to surface soil based on a residential risk value of 10⁻⁶. Based on conversations with the USACE, it was decided to define surface soils as those within 12 inches below the ground surface. Following the initial excavation, confirmation samples were collected and those areas still above action levels were excavated an additional six inches in a ten foot by ten foot square around the sample point. Upon receipt of confirmation results, the depths of excavations were measured and found to be between 13 and 19 inches. Although some of the confirmation samples were above action levels, it was concluded that additional excavation was not necessary since the excavation depths were below the surface soil range. Confirmation samples for the sewer line were collected in a similar manner except the action levels corresponded to an industrial risk scenario of 10⁻⁴ (due to reduced exposure potential associated with subsurface soil), and instead of collecting samples on a grid, samples were collected every 25 feet at a depth of approximately four feet.







5.0 GROUNDWATER

5.1 Site Hydrogeology

The glacial till beneath the sites ranges in textural composition from clay to sand. This till can best be described as clay with trace amounts of silt, sand and gravel, with occasional sand stringers (glacial outwash). The oxidized till is generally brownish gray with orange mottling. A locally thicker layer of loess overlies this relatively thin layer of till. The loess is most commonly a silt or fine sand with appreciable clay fines. It is estimated to range from less than five feet to 20 feet thick in the Fort Des Moines area. More site-specific information was obtained during Versar's drilling efforts in 1990 to 1993. Observations made during drilling activities revealed that deposits of silty and sandy clay or silty sand were present to the maximum boring depth of 45 feet. Thin layers or lenses of outwash sand sandwiched between clay layers typical to glacial deposits were also encountered. Limestone bedrock was encountered at a depth of 45 feet in soil boring 19D, which was a fully penetrating well located within the Blank Park Zoo parking lot. Two cross sections were prepared to help depict the subsurface geology present at the site and are included in Appendix C. One cross section was prepared to represent the geology along the approximate plume centerline and the second one is a lateral cross section perpendicular to the plume centerline.

The depth-to-water measurements recorded during monitor well sampling events and the elevation of nearby surface-water bodies, combined with the relatively flat topography of most of the site, provided information regarding the inferred hydraulic gradient within the surficial water-bearing zone. Groundwater flow within the surficial water-bearing zone and upper bedrock material is in the same direction as the topography, which slopes predominately to the south and southwest. Due to the distance and flow direction of the surficial water-bearing zone relative to the location of the Des Moines River (four miles north of the site), it is highly unlikely that there is any hydraulic communication between the surficial water-bearing zone at FDM and the Des Moines River. The depth to groundwater in the vicinity of the site ranges from 22 to 46 feet below ground surface (bgs). The historical groundwater level data are shown in Table 5-1, which includes the available data from VERSAR, OHM, and CAPE Environmental and covers the time period from March 91 through June 2000.

Potentiometric groundwater surface isocontours are shown in Figures 5-1 through 5-3 for the following dates: February 1993, September 1996, and March 2000. These dates were chosen based on the availability of groundwater level data and to show how the potentiometric surface varies throughout the period of available data. Overall, the flow direction did not vary significantly throughout this period and remains to the southwest.

The groundwater encountered in the surficial water-bearing zone is hard (due to the natural occurrence of calcium and magnesium constituents in the water-bearing unit) and contains undesirable concentrations of sulfates, nitrates, and bacteria. The occurrence of sulfates and nitrates may be attributed to the high intensity use of agricultural chemical residues or they may occur naturally. Monitoring wells installed in close proximity to







former Buildings 67 and 138 have also evidenced pesticides contamination of the surficial water-bearing zone in previous sampling events. However, despite the fact that groundwater in the surficial water-bearing zone has been impacted by the contaminant releases documented to have occurred at FDM, it is also fair to document that regionally high background concentrations of pesticides, fertilizers, and other residual wastes greatly restrict the potential uses of the surficial water-bearing zone.

Table 5-1 Historical Groundwater Level Data Fort Des Moines, Iowa

Monitoring Well	Mar 91	Oct 92	Dec 92	Feb 93	Sep 96	Oct 99	Dec 99	Mar 00	June 00 ,
	VERSAR	VERSAR	VERSAR	VERSAR	OHM	CAPE	CAPE	CAPE	CAPE
MW-1	929.40	922.41	925.87	925.02	926.28				
MW-2	909.08	907.72	909.11	908.09	907.93				
MW-3	907.33	907.03	907.62	NR	907.13				
MW-4	909.74	906.61	907.71	NR	906.90				
MW-5	926.56	NR	925.51	NR	923.13				
MW-6	930.16	NR	928.89	NR	926.76				
MW-7	NA	928.07	933.60	930.12	936.79				
MW-8	NA	931.81	934.12	NR	935.1				
MW-9	NA	922.56	926.61	NR	924.89				
MW-10	NA	911.80	914.40	912.13	911.9				
MW-11	NA	904.06	905.91	904.53	904.46				
MW-12	NA	NR.	931.20	NR.	931.54				
MW-13	NA	NR	937.14	NR	934.0				
MW-14	NA	935.13	935.90	935.51	936.03				
MW-14D	NA	NR	938.28	937.52	939.17				
MW-17	NA	924.75	928.53	926.27	924.35	921.90	919.49	918.02	902.03
MW-18	NA	918.91	922.91	919.92	918.89	917.29	916.07	915.76	904.80
MW-19S	NA	908.75	910.76	909.89	908.6	909.00	908.76	908.66	896.44
MW-19D	NA	909,83	910.46	909.97	910.35	910.72	910.44	910.27	898.65
MW-20	NA	NA	NA	936.14	935.91	NR	NR	NR	NR
MW-21	NA	NA	NA	932.01	933.16	923.92	921.49	919.35	901.89
MW96-1						920.46	919.09	918.71	903.57
MW96-2						Dry	Dry	Dry	Dry
MW99-3						920.05	918.51	917.80	906.36
MW99-4						916.47	915.63	915.47	910.38
MW99-5						914.61	913.92	913.43	902.47
MW99-6	41 44 6					909.57	909.22	908.87	906.93

NA = Not Applicable (wells were not present)

NR = No samples taken

The State of Iowa has delegated permit authority for water wells to Polk County. Polk County regulations state that no non-public water well shall be installed or reconstructed





until a permit has been issued. In addition, no non-public water supply system shall be installed where a public water supply system is reasonably accessible unless approved by the Health Officer. Other laws, dating back to the early 1900's, were created to condemn wells deemed to produce water unfit for human consumption in response to outbreaks of cholera and typhoid. As a result of these conditions, most of the surficial water-bearing zone wells within the City of Des Moines have been abandoned.

The water well regulations reduce the potential for human contact or domestic use of groundwater to a negligible level because all local residents are required to use the municipal water supply system. The City of Des Moines' supply of municipal water comes from wells that tap the Cambro-Ordivician Aquifer and from the Des Moines and Raccoon Rivers.

Hydrogeologic characterization tests, including slug and pumping tests, were performed at the FDM site to determine the hydraulic characteristics (transmissivity, hydraulic conductivity, and storativity) of the shallow water-bearing zone. These tests were performed to evaluate the potential mobility and extent of groundwater contaminant plumes.

The hydraulic conductivity (K) values calculated for monitoring well MW-18 and for the first straight line portion of the draw-down curve for well MW-18W are in very close agreement. The geometric mean of these K values is approximately 8.5 x 10⁻⁴ ft/min. K values calculated for the second portion of the draw-down curve for well MW-18W are in very close agreement. The geometric mean for the two values is approximately 3×10^{-4} ft/min. These data may not, however, accurately represent unbounded flow in the shallow water-bearing zone.

The results of the pumping test are in close agreement with the results of the slug tests (K=geometric mean of 1.5 x 10⁻⁴ ft/min). These values are consistent with values that would be expected for the unconsolidated deposits screened by monitoring well MW-18 and the two observation wells.

Storativity values calculated from the pumping test resulted in site-specific storativity values ranging from 3.7×10^{-2} in MW-18W to 6.6×10^{-3} in MW-18.

5.2 Groundwater Characterization

The following is a summary and interpretation of the groundwater monitoring data collected from March 1991 through February 1993 by Versar; June 1996 through June 1997 by OHM; August 1996 by USACE-Omaha; and December 1999 through August 2000 by Cape Environmental Management. The data was streamlined and compiled by JMWA into a data summary table, which highlights instances where constituent results exceeded action levels and specifies the respective contractor's sampling efforts and results. The action levels are based mostly on MCLs and Health Advisory Levels (HALs), which have been adopted by Iowa. Where those values did not exist, Risk Based Concentrations were calculated based upon guidance from the Iowa







Administrative Code. A detailed spreadsheet of groundwater sampling results can be found in Appendix B and the risk-based concentrations can be found in Appendix E.

5.2.1 Volatile Analysis

Tetrachloroethene (PCE) was reported above the MCL of 5 micrograms per liter (ug/L) in MW-1, MW-17, MW-18, MW-18E, MW-18W, MW-19S, MW-96-2, and MW99-4. In MW-17, which was the most contaminated well overall, PCE ranged from 500 ug/L in October 92 to non-detect (ND) in December 99. The most recent reading was 61 ug/L in June 2000. In MW-18, PCE ranged from 175 ug/L in October 92 to ND for multiple sampling events. The most recent reading was 48 ug/L in June 2000. In MW-19S, PCE ranged from 15.7 ug/L in June 96 to ND for multiple sampling events. The most recent reading was ND in June 2000. A concentration of 1100 ug/L was reported in MW96-2 in August 1996, which was the only date the well was sampled.

Trichloloroethene (TCE) exceeded the action level of 5 ug/L in monitoring wells MW-1, MW-17, MW-18, and MW99-4 for one or more sampling events. In MW-17, TCE ranged from 200 ug/L in October 92 to ND in December 99. The most recent reading was 45 ug/L in June 2000.

Cis-1,2-Dichloroethene exceeded the MCL of 70 ug/L one time in MW-17 at a concentration of 100 ug/L, Cis-1,2-Dichloroethene was not detected above the MCL at any other location.

Carbon Tetrachloride was detected above the MCL of 5 ug/L in monitoring wells MW-18, MW-18E, and MW96-2. Carbon tetrachloride was exceeded during six sampling events at MW-18 and ranged from 20 ug/L in February 93 to ND in December 99. The most recent concentration was 7.7 ug/L in June 2000. MW-18E exceeded action levels three times for Carbon Tetrachloride, ranging from 34 ug/L in September 96 to 31 ug/L in June 97.

Benzene was detected at MW96-2 at 28 ug/L in August 1996, which was the only date the well was sampled.

In summary, PCE and TCE (which is a degradation product of PCE), are considered the VOC COCs for groundwater. This is based on the frequency and consistency of their detection. These contaminants have decreased significantly at all locations and have decreased below MCLs, except at source locations such as MW-17.

5.2.2 Pesticide Analysis

Alpha BHC was detected above the RBC of 0.028 ug/L in MW-1, MW-2, MW-10, MW-17, MW-18, MW-19S, MW96-2, MW99-4, MW99-5. In MW-1, alpha BHC ranged from 6.95 ug/L in October 92 to 0.034 ug/L in June 96. The most recent concentration was 0.69 ug/L in June 97. In MW-17, which is the most contaminated well overall, alpha BHC ranged from 67 ug/L in October 92 to ND in December 99. The most recent







concentration was 0.91 ug/L in June 2000. In MW-18, alpha BHC ranged from 6.81 ug/L in October 92 to ND in December 99. The most recent concentration was 0.034 ug/L in June 2000. A concentration of 83 ug/L was reported in MW96-2 in August 1996, which was the only date the well was sampled.

Beta BHC was detected above the RBC of 0.097 ug/L in MW-1, MW-2, MW-10, MW-11, MW-12, MW-17, MW-18, MW19-S, MW96-2, MW99-4, MW99-5. In MW-1, beta BHC ranged from 5.42 ug/L in October 92 to 0.199 in June 96. The most recent concentration was 0.37 ug/L in June 97. In MW-2, beta BHC ranged from 5.14 ug/L in March 91 to 0.24 in June 97. The most recent concentration was 0.24 ug/L in June 97. In MW-17, which is the most contaminated well overall, beta BHC ranged from 6 ug/L in October 92 to ND in December 99. The most recent concentration was 0.91 ug/L in June 2000. In MW-18, beta BHC ranged from 9.04 ug/L in October 92 to ND in December 99. The most recent concentration was 0.02 ug/L in August 2000. A concentration of 4 ug/L was reported in MW96-2 in August 1996, which was the only date the well was sampled.

Delta BHC was detected above the RBC of 0.21 ug/L in MW-1, MW-2, MW-11, MW-17, MW-18, MW96-2. In MW-1, delta BHC ranged from 4.33 ug/L in December 91 to 0.382 in June 96. The most recent concentration was 0.97 ug/L in June 97. In MW-2, delta BHC ranged from 4.19 ug/L in March 91 to 0.96 ug/L in June 97, which was the most recent sample. In MW-17, which is the most contaminated well overall, delta BHC ranged from 25 ug/L in October 92 to ND in December 99. The most recent concentration was 0.21 ug/L in June 2000. In MW-18, delta BHC ranged from 58 ug/L in October 92 to ND in December 99. The most recent concentration was 0.014 ug/L in August 2000. A concentration of 5 ug/L was reported in MW96-2 in August 1996, which was the only date the well was sampled.

Lindane was detected above the MCL of 0.2 ug/L in MW-2, MW-11, MW-17, MW-18, and MW96-2. In MW-17, which is the most contaminated well overall, Lindane ranged from 61 ug/L in October 92 to ND in December 99. The most recent concentration was 0.47 ug/L in June 2000. A concentration of 17 ug/L was reported in MW96-2 in August 1996, which was the only date the well was sampled. In MW-1, the concentration ranged from 6.08 ug/L in October 92 to 0.04 ug/L in June 96. The most recent concentration was 0.075 in June 97.

Dieldrin was detected above the MCL of 2 ug/L in MW-1, where Dieldrin ranged from 1.15 ug/L in December 91 to 13 ug/L in February 93. The most recent concentration was 8.1 ug/L in June 97.

DDD exceeded the RBC of 0.729 ug/L for three sampling events in MW-1. The highest recorded level was 1.12 ug/L in December 91 and the lowest was ND in June 96. The most recent was 0.47 ug/L in June 97.

In summary, alpha-BHC, beta-BHC, and delta-BHC are considered the pesticides of concern for groundwater. This is based on the frequency and consistency of their





detection. These contaminants have decreased significantly at some locations and only slightly at others, which is expected given their resistance to biodegradation and their low water solubility.

5.2.3 Herbicide Analysis

For 2,4,5-T, the MCL of 100 ug/L was exceeded at MW-17. The concentration ranged from ND in September 96 to 1,200 ug/L in June 97. The most recent concentration was 1200 in June 97 since 2,4,5-T was not analyzed after that date.

For 2.4-D, the MCL of 70 ug/L was exceeded at MW-17. The concentration ranged from 3 ug/L in February 93 to 8,360 ug/L in Sep. 96. The most recent concentration was 3,900 ug/L in June 97 since 2.4-D was not analyzed after that date.

All the exceedances for herbicides were located at MW-17, which is close to the source area; therefore herbicides are not considered COCs. Unfortunately from a data evaluation perspective, herbicides were not analyzed for in most locations after June 97.

5.2.4 Metals Analysis

The EI/RA/AA included analysis of groundwater samples for Target Analyte List (TAL) metals. A total of 19 metals were detected in the groundwater samples. However, several of the detected metals, such as calcium, magnesium, and sodium are possibly the result of the clay minerals in the area since they were also found in the uncontaminated portions of the Site. The presence of iron and zinc may be the result of oxidation of metal pipes and debris at the site. Arsenic, chromium, and lead are present at slightly elevated levels but could have been transported from debris into ephemeral streams after rainfall events. The standards for all other metals are based on risk. Also, due to the adsorption potential of metals, their potential for migration is low. For these reasons, metals are not chemicals of concern at the FDM Site

Monitoring Well Location Rationale 5.3

Monitoring wells for the Fort Des Moines Site were initially installed in four phases in conjunction with BRAC actions. See Figure 5-1 for the location of all monitoring wells. In Phase I, well MW-1 was placed as an upgradient well to provide potential data on background water quality. MW-2 was placed downgradient of the abandoned elevator shaft located in Building 138 to intercept possible leaking oil. MW-3 was placed downgradient of USTs 1 and 2 to assist in evaluating the integrity of these tanks. MW-4 was placed downgradient of a suspected contaminant source area located in the southwest portion of FDM to provide water quality information on the shallow groundwater migrating off the site. Well MW-5 was placed downgradient of Unrestricted Disposal Area 2 to determine whether contaminants from that area were affecting the groundwater quality of the shallow water-bearing zone. Well MW-6 was placed upgradient of Unrestricted Disposal Area 2 to provide background information for comparison to MW-5.







In Phase II, wells MW-7, MW-8, and MW-9, were placed upgradient of well MW-1 to aid in defining the areal extent of a possible source area for the previously detected contamination. Well MW-10 was placed immediately downgradient of Building 138 to determine whether the detected contamination in the building was actually contributing to the local shallow groundwater problem. Well MW-11 was placed as far downgradient of Building 138 as possible while still remaining on FDM property. The purpose of the well was to monitor the quality of the groundwater migrating offsite from FDM. Wells MW-12 and MW-13 were placed to monitor the quality of the shallow groundwater near the southeast corner of FDM where several USTs exist. Because of the detection of contaminants in MW-1, which was originally intended to be the background well, a new background well (MW-14) was installed at a location as far upgradient of MW-1 as possible and yet still remain within the boundaries of the current FDM property.

In Phase III, MW-14D was constructed to monitor the water quality of the deeper portion of the shallow water-bearing zone within the designated background location. Wells MW-17 and MW-18 were installed to monitor the water quality within and downgradient of the location of former Building 67. Wells MW-19 and MW-19D were installed to monitor the water quality downgradient of the area where the highest level of VOC contamination was found during the hydropunch survey performed during this phase. Well MW-19S was constructed as a water table well to allow for the monitoring of the top of the shallow water-bearing zone. Well 19D was constructed as a fully penetrating well to monitor the water quality at the bottom of the shallow water-bearing zone and to determine whether a dense free phase layer was present.

In Phase IV, MW-20 and MW-21 were installed in order to determine whether the contamination detected in wells MW-17 and MW-18 was originating from FDM or from an off-site source.

After the initial four phases of monitoring well installations were completed in conjunction with BRAC activities, the USACE-Omaha installed two monitoring wells downgradient from former Building 67 for work related to FUDS investigations. These monitoring wells, designated as MW96-1 and MW96-2, were installed in 1996 as part of the Site Investigation associated with Former Building 67. The placement of MW96-1 and MW96-2 downgradient of former building 67 was based on visual evidence of past investigation of the BRAC area to the east (including building 138) and historical background information regarding the location of Building 67.

Following the installation of monitoring wells MW96-1 and MW96-2, an EE/CA was prepared to outline the extent of contamination, risk pathways, and alternative remediation methods. Recommendations from the EE/CA were to install one new upgradient (MW99-3) and three downgradient (MW99-4, MW99-5, and MW99-6) monitoring wells to better define the plume boundary.

Most of the wells were located using a handheld Global Positioning System (GPS) device. Wells that were not located with a GPS are MW96-1, MW96-2, MW99-3,





MW99-4, MW99-5, and MW99-6. Well Construction logs can be found in Appendix C with the exception of monitoring wells MW99-3, MW99-4, MW99-5, and MW99-6.

The approximate location of the tetrachloroethene plumes are included in Figures 5-4 through 5-7. Tetrachloroethene was chosen since it was detected more frequently and consistently than the other COCs. Depicting plume movement is an inexact science. Plotting these figures was even more problematic due to data gaps such as sampling of different wells for successive events. These figures should be considered approximate locations with a limited degree of accuracy.

5.4 Conceptual Site Model

The objective of this conceptual site model is to present a qualitative evaluation of the nature and extent of the impacted soil and groundwater media and assess the potential for transport of contaminants to human or ecological receptors. Using data from the VERSAR EI/RA/AA, the hydrogeological conditions at FDM were qualitatively evaluated. A quantitative groundwater model could not be developed with the existing data set, as site-specific climatological information (evaporation, infiltration, runoff data, and upgradient flow characteristics) was not readily available, or could not be quantified within reasonable limits. However, based on the available data some general conclusions about the potential of significant groundwater transport can be proposed.

The area included as part of this evaluation can roughly be considered a triangle, see the Site Layout in Figure 2-2. Blank Park Creek forms the western boundary of the triangle and is also a discharge zone for groundwater to surface water. The intermittent stream, which runs northeast to southwest, forms another side of the triangle. The third side of the triangle is an imaginary line connecting the uppermost reaches of both the Blank Park Creek and the intermittent stream. The site sources (building 138, former building 67, and the storm sewer between them) are located within the upgradient portions of the triangle.

All sources of site contamination (building 138, building 67, and the storm sewer between them) lie within a groundwater recharge area. It is important to note that all three of these areas have had soil removal actions and therefore rainfall-induced infiltration does not necessarily contribute to groundwater contamination. There are also numerous storm sewers at the property, which affect very localized movement of surface and groundwater but are not expected to alter the overall discharge patterns at the site.

The average annual rainfall is 30.83 inches and shows strong seasonal variation, with maximum rainfall occurring in spring and early summer. June is the wettest month, with an average of 4.18 inches of rain. January is the driest month, with normal precipitation of about 1.01 inches (ICF, 1990).

Groundwater at FDM exists in an unconfined water-bearing zone and its flow is generally controlled by topography. Groundwater flow in this surficial water-bearing zone (silt/clay, till, and other fine-grained materials) is predominantly to the southwest, toward





Blank Park Creek. The depth to groundwater in the vicinity of the site ranges from 22 to 46 feet bgs, depending on its proximity to Blank Park Creek on the west and the intermittant stream to the southeast. Limestone bedrock was encountered at a depth of 45 feet in MW-19D, which appears to be the approximate depth to the base of the surficial water-bearing zone.

Hydraulic conductivity within the unconfined zone was calculated from onsite slug and pumping tests. The pumping test was conducted in MW-18 with MW-18E and 18W used as observation wells. The result of the pumping test ($K = 1.5 \times 10^{-4}$ ft/min) is consistent with the average value obtained from the slug tests ($K = 1.6 \times 10^{-4}$ ft/min), which were conducted in 13 separate monitoring wells. The geometric mean of transmissivity as calculated from the drawdown data collected from the pumping test was 225 gpd/ft.

The low transmissivity of the shallow water-bearing zone, along with the relatively flat groundwater gradient, indicates that the mobility of the existing groundwater contaminants is limited. Also, pesticides have high adsorption coefficients that would slow the migration of these contaminants southward. For example alpha-BHC, one of the pesticides of concern, has an octanol water partition coefficient of approximately 7,500 and a water solubility of only 1.63 mg/L, both of which contribute to alpha BHC's limited mobility.

There are four ponds located in Blank Park Zoo: the Lagoon pond, Flamingo pond, Australian Outback pond, and the Sea Lion pond. Based on interviews with zoo personnel, the Flamingo and Sea Lion ponds are lined and are therefore not likely to intercept groundwater. Both the Australian Outback and Lagoon ponds are unlined, earth bottom ponds. The Lagoon pond is approximately seven feet at its deepest point and the Australian Outback pond is about four feet at its deepest point. Although the exact depth to groundwater in the vicinity of these ponds is unknown, it is unlikely that the depth to groundwater is less than seven feet based on the depth to groundwater encountered elsewhere at the site and the sloping topography between Blank Park Creek and Lagoon pond (the nearest pond). Based on this information, it appears that there is little or no connection between the shallow groundwater zone and the ponds in Blank Park Zoo.

Because of local restrictions in Polk County, the shallow groundwater zone is not used as a potable water source. The low transmissivity and well yields in this water table zone makes potable use unlikely in the future as well. Also, due to the adsorption potential of the pesticides, impact to the streams from groundwater is minimal. Therefore, exposure to groundwater is not considered as a potential pathway for human receptors.

Overall, surface water drainage at FDM is generally to the southwest, following local topography. In the area around former Building 67, the surface runoff would flow directly to nearby Blank Park Creek via overland flow. Some surface runoff from Building 138 has the potential to travel across the nearby zoo property line via overland flow where it would be intercepted by an intermittent stream, which enters Blank Park Zoo. All surface water flow from the site eventually enters either Blank Park Creek or the intermittent stream south of FDM. Blank Park Creek is located to the west of FDM



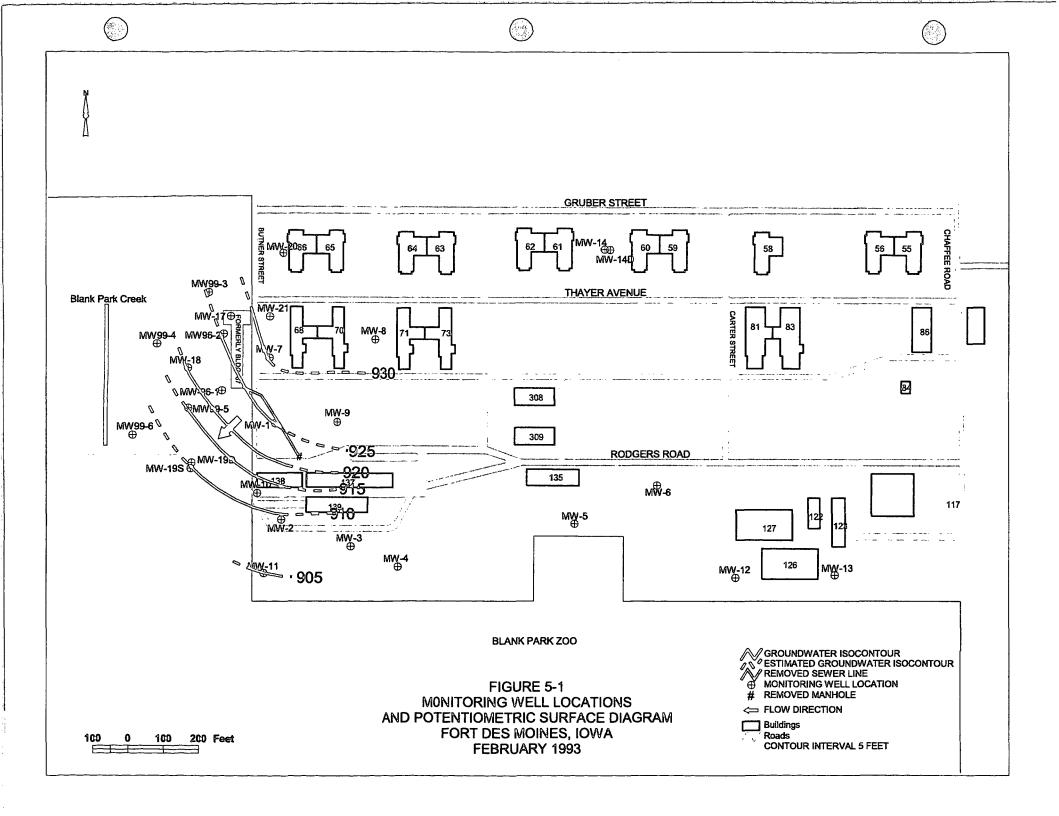


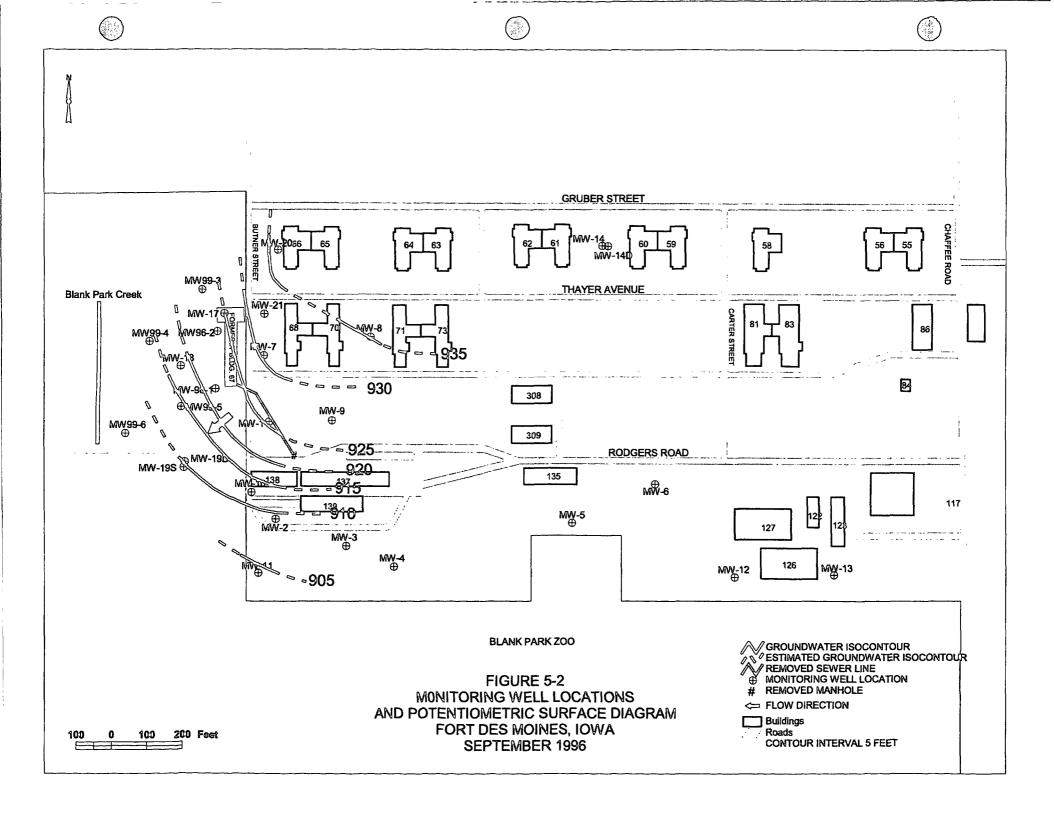
and flows toward the south for approximately 350 to 400 feet before entering a concrete culvert that runs below the Blank Park Zoo parking lot. Of the four zoo ponds, the Lagoon pond is closest to Blank Park Creek and could accept water from the creek via a valve that is in place. However, that valve has never been opened and all waters from Blank Park Creek are effectively routed around the zoo.

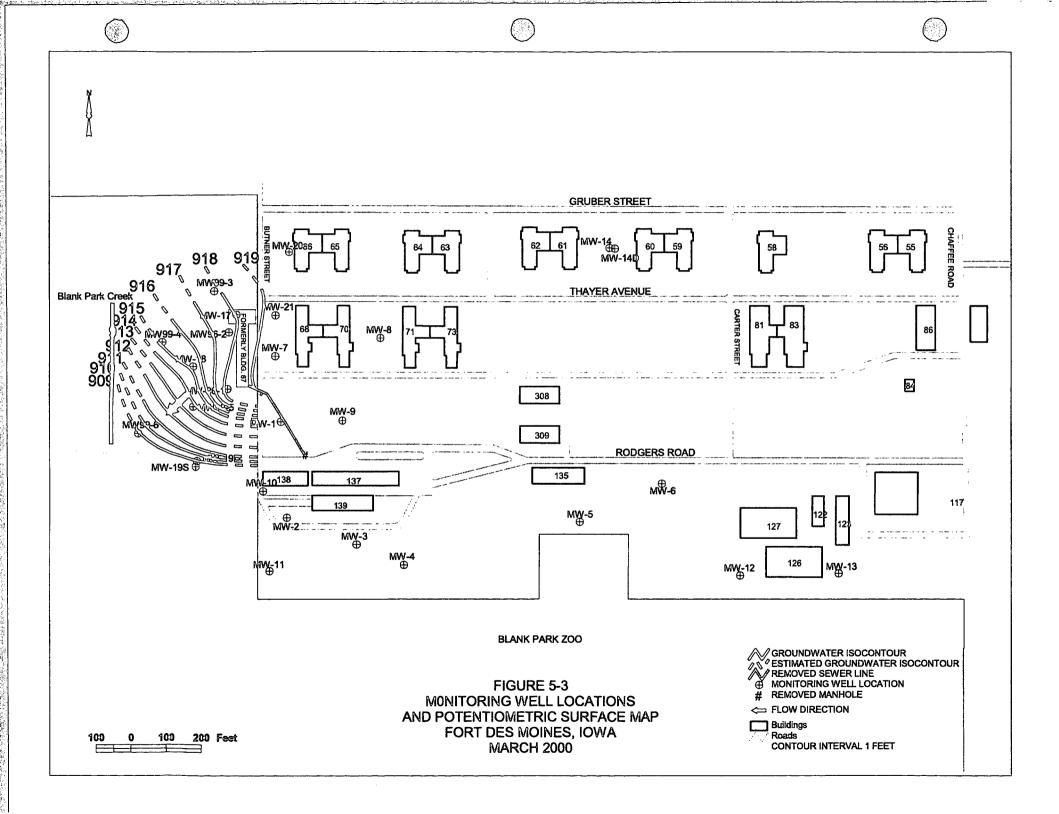
Potential surface water exposures were evaluated in the VERSAR risk assessment. Only dermal exposure scenarios for recreational users were considered; ingestion of surface water was not considered to be a realistic pathway considering the size of the two small intermittent streams (approximately one foot wide and three inches deep and their ephemeral nature). Also, due to their ephemeral nature, the presence of any sustainable fish and other aquatic life is unlikely. As part of Versar's risk assessment the sediments in Blank Park Creek were also evaluated for their impact on zoo animals. The risk assessment concluded there are no unacceptable risks to these animals from direct ingestion of surface water, sediment, or groundwater based on available toxicity data. Based on the low potential for routine exposure, the human and ecological risk from water and sediments within the Blank Park Creek and the ponds appears to be minimal.

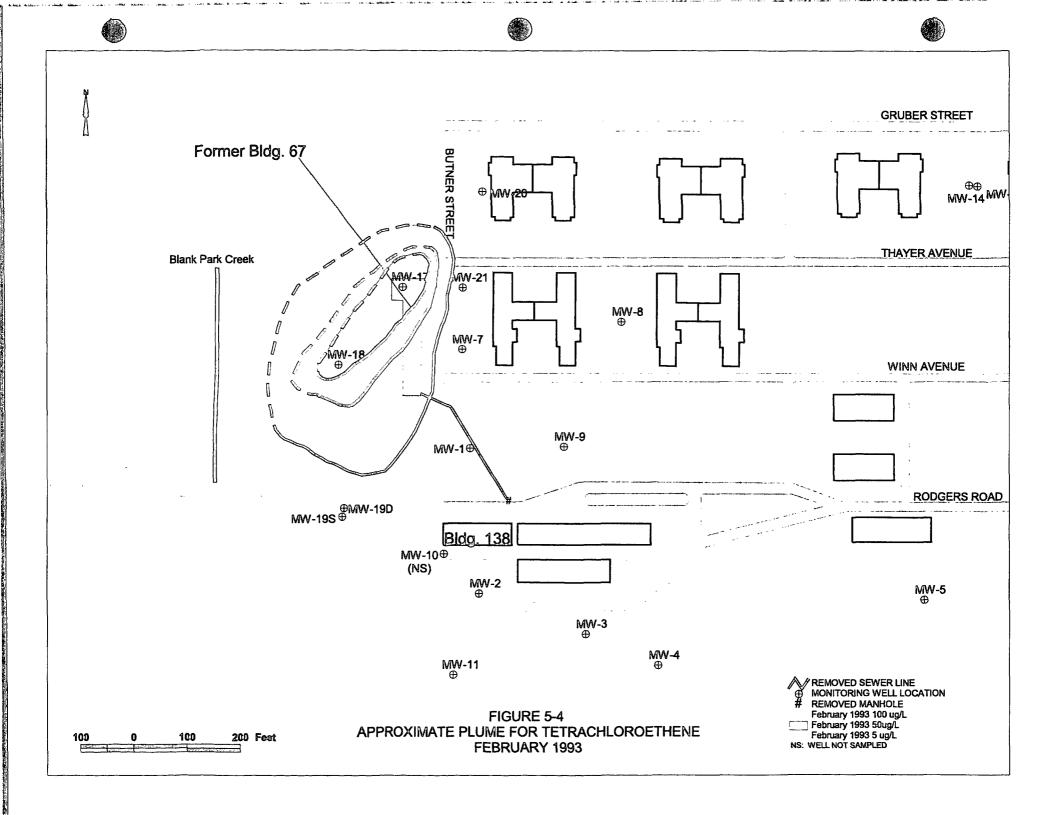


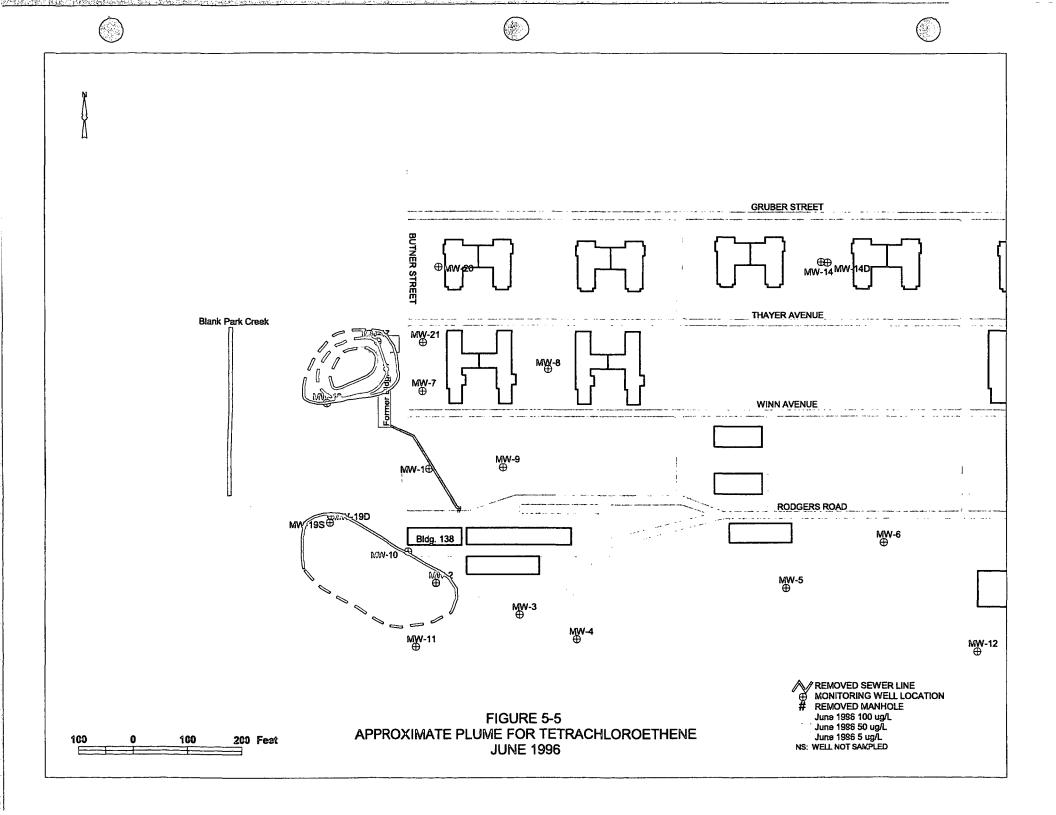


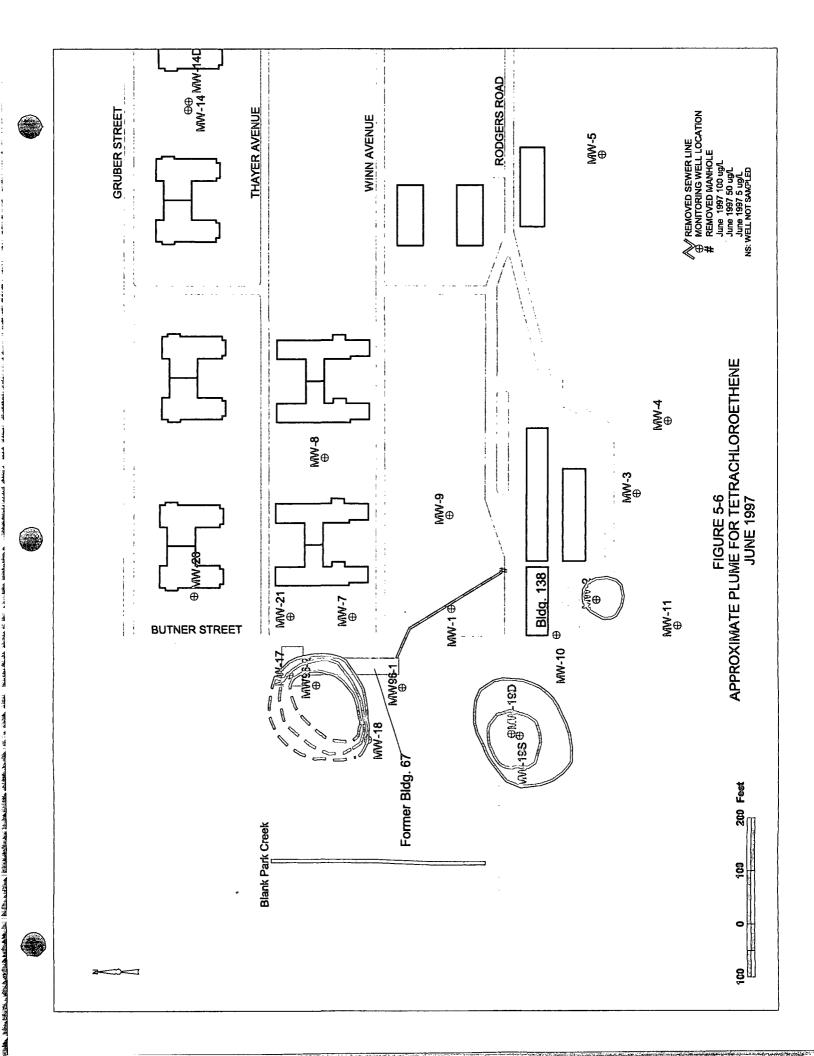


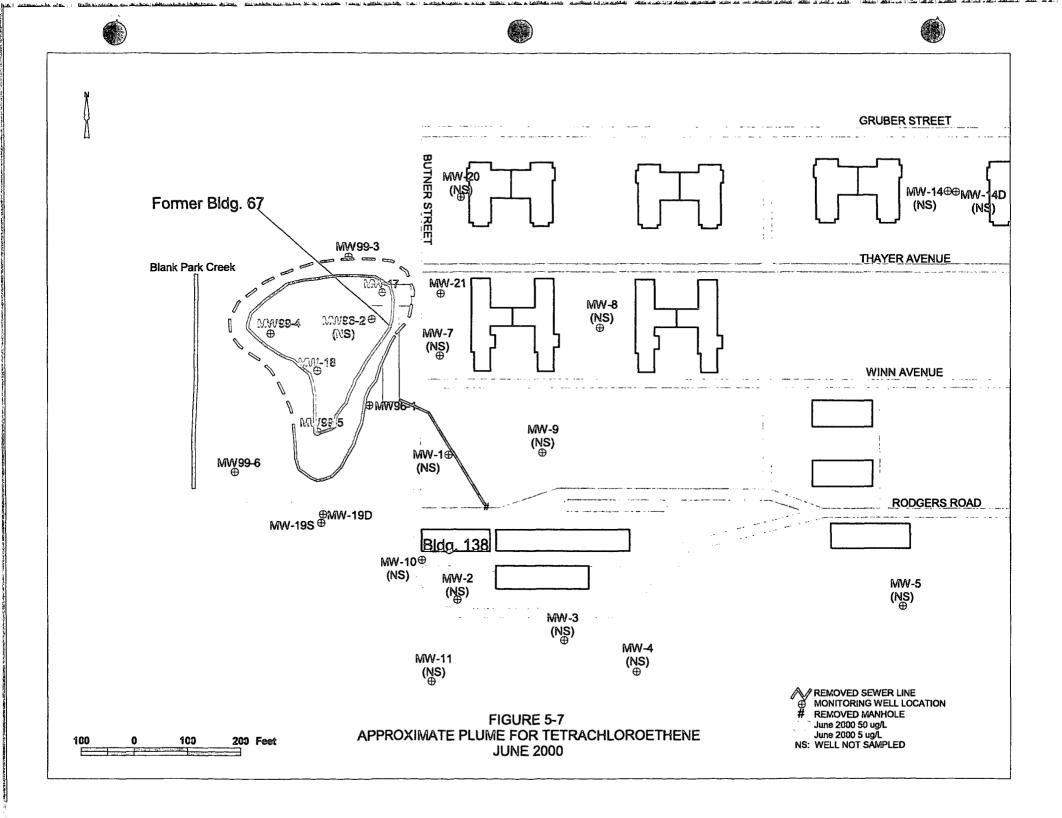














6.0 DATA GAPS

JMWA has identified several data gap items that require further clarification. Decisions made in regard to these items may affect the conclusions and recommendations found in Section 7.0 of this report. These items are:

- Confusion still exists between IDNR and the EPA as to who is the lead agency for any actions that BRACO takes at FDM (see Mr. Cook and Mr. Koke memos in Appendix D). Specifically, there has been no formal regulator concurrence that sufficient monitoring has been conducted or that the BRAC or FUDS properties are suitable for transfer.
- 2. The Army's response to the property transfer, on both the BRAC and FUDS properties, was to conduct long-term monitoring. The data that JMWA has gathered to date suggests that limited sampling of the monitoring wells has occurred since 1997. JMWA has not found any documentation to suggest that the Army's official position to perform long-term groundwater monitoring, as stated in decision documents for both properties, was officially abandoned by the Army.
- 3. Groundwater monitoring has been inconsistent over the course of various site investigations. Versar sampled groundwater in March 1991, July 1991, December 1991, October 1992 and February 1993. OHM conducting sampling rounds in June 1996, September 1996, January 1997, and June 1997. USACE-Omaha installed two additional monitoring wells and conducted one round of sampling in August of 1996. Cape Environmental Management installed four additional monitoring wells and sampled several of the wells installed by Versar. Cape Environmental Management performed sampling during December 1999, March 2000, June 2000, and August 2000.

The duration of time between certain sampling events, the sporadic nature of which wells were sampled, and the variation in type of laboratory analysis performed after samples were collected make it difficult to form a definitive picture of groundwater contaminant concentrations over time at the site. It also renders groundwater modeling software useless. The "hot spot" around the BRAC and FUDS property boundary was undoubtedly the area of highest interest due to the concentrations and numbers of COCs discovered there.

- 4. Monitoring wells MW96-1, MW96-2, MW99-3, MW99-4, MW99-5, and MW99-6 were not on the list of wells to be closed since JMWA only discovered the presence of these monitoring wells after extensive document review. BRACO may want to add these wells to the list of wells for closure.
- 5. JMWA has not located or positively identified the location of all the monitoring wells mentioned above. For example, despite two field searches JMWA has been unable to locate monitoring well MW-10. According to previous site maps, MW-10 should be located in an unpaved area on the BRAC property just southwest of Building 138.







7.0 CONCLUSIONS AND RECOMMENDATIONS

Since contaminated soils can adversely affect groundwater, JMWA developed conclusions and recommendations for both soil and groundwater media at FDM. In regard to concerns related to contaminated soil, JMWA evaluated historical soil sampling and remediation efforts conducted by OHM and Cape Environmental Management. To form conclusions and recommendations for groundwater, JMWA reviewed previous groundwater sampling data obtained during sampling events on both the BRAC and FUDS properties at FDM. We also reviewed other historical documentation and identified areas where additional information would be helpful.

7.1 Soil Conclusions and Recommendations

Based on the information and related documentation provided in Section 4, soil contamination was identified at both former building 67 and building 138 based on fairly extensive sampling during the site characterization phase. The contaminated soils in Building 138 and vicinity have been addressed by the removal action conducted by OHM. Based on the Removal Action Memorandum dated July 7, 1995, soils were removed until concentrations of contaminants were at or below health-based standards. Also, due to the physical and chemical properties associated with pesticides, it is not expected that any residual pesticide contamination would migrate appreciably from the source areas. Therefore, we recommend No Further Action for the soils in the vicinity of former Building 138.

Based on information from the USACE-Omaha 1996 SI for the FUDS area including former Building 67, soils contaminated with VOCs and pesticides existed in the vicinity of Building 67 and these contaminant concentrations exceeded both State action levels and risk-based concentrations. The contaminated soils within the footprint of former Building 67 and the storm sewer line to the east of the building have been addressed by the removal action conducted by Cape Environmental Management in 1999. Due to this removal action and the low migration potential of any residual pesticide contamination that may be present, we recommend No Further Action for soils in the vicinity of former Building 67.

Groundwater Conclusions and Recommendations

Based on the decreasing trend of groundwater results presented in section 5, we believe the appropriate path forward is to collect one additional round of groundwater samples from existing monitoring wells, which should indicate that all contaminants are now near or below action levels. Pending the results of the sampling round, BRACO can then petition the State of Iowa for closure of all on-site monitoring wells. This recommendation was reached after evaluating three potential groundwater alternatives including: closure (No Further Action), LTM, and groundwater treatment.







Groundwater treatment was quickly ruled out because a pump and treat scenario is not likely to be technically feasible due to the low yield characteristics of the shallow water-bearing zone in question, and because groundwater at the site is not a usable resource and there would be no benefit in providing treatment for a resource that will not be used. Long term goundwater monitoring was also ruled out because groundwater is not a usable resource and continued monitoring would not provide additional benefits.

Closure of the existing wells has been chosen as the recommended alternative for the following reasons: (1) based on sampling data collected since 1991, groundwater contamination has decreased significantly through dispersion and natural attenuation, (2) Polk County has placed restrictions on the use of the shallow water-bearing zone which would prevent residents at or near the site from direct exposure to any contaminated groundwater which may be present, (3) there is no appreciative migration of contaminants or pathways to suggest that potable water resources may be impacted, (4) based upon the risk assessment conducted by VERSAR, there were no unacceptable risks at Blank Park Zoo to either the human or animal populations, and (5) preliminary conversations with the State and EPA indicate that they may be agreeable to closure of these wells.

7.2.1 Recommended Alternative (Additional Monitoring Followed by Well Closure)

Additional Monitoring Event

The most recent available groundwater monitoring data is for August 2000. As mentioned above, collection of an additional round of groundwater samples prior to the closure process is recommended. An additional round of groundwater samples would be beneficial for the following reasons: (1) it would provide current data, which because of the two plus year gap since the last sampling event, would likely show that contaminant concentrations are decreasing since August 2000, (2) it would identify whether contamination is low enough to allow JMWA and its contractor to abandon the wells without posing unacceptable health risks to the workers, and (3) it would demonstrate to the regulators that BRACO made a good faith effort to provide justification for closure.

Due to their age, some of the existing wells may not be capable of being sampled. In fact based on an OHM memo dated September 1997, some of the monitoring wells are in poor condition (silt has accumulated in some of the wells, surface seals are in poor condition, and well plugs are missing). Therefore, the first recommended task would be to perform a well condition survey at the site to ensure that the wells of interest are accessible and that they are not clogged from fines and/or debris. This will include a search of all available "as built" documentation on the monitoring wells and a field survey to locate the wells and determine if there is any blockage which would prevent collection of a representative sample. In the event that the wells of interest are not capable of being sampled, a decision will be made as to whether some form of well maintenance (re-development, removal of fines, etc.) should be performed or whether a nearby well can be sampled instead. Table 7-1 below identifies the justification for



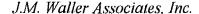


which wells should be sampled. A total of nine wells are proposed for the additional monitoring effort.

Table 7-1
Justification for Disposition of Monitoring Wells

Well	Disposition	Justification
MW-1	Monitor and close	Source area with previous contamination
MW-2	Close	Not needed, close to MW-10
MW-3	Close	Contaminants consistently within acceptable levels
MW-4	Close	Contaminants consistently within acceptable levels
MW-5	Close	Contaminants consistently within acceptable levels
MW-6	Close	Contaminants consistently within acceptable levels
MW-7	Close	Contaminants consistently within acceptable levels
MW-8	Close	Contaminants consistently within acceptable levels
MW-9	Close	Contaminants consistently within acceptable levels
MW-10	Monitor and close	Location of previous contamination
MW-11	Monitor and close	Point of Compliance at Site boundary
MW-12	Close	Contaminants consistently within acceptable levels
MW-13	Close	Contaminants consistently within acceptable levels
MW-14	Monitor and close	Background well
MW-14D	Close	Not needed, close to MW-14
MW-17	Monitor and close	Location of previous contamination
MW-18	Monitor and close	Location of previous contamination
MW-18E	Close	Not needed, close to MW-18
MW-18W	Close	Not needed, close to MW-18
MW-19S	Monitor and close	Location of previous contamination
MW-19D	Close	Not needed, close to MW-19S
MW-20	Close	Contaminants consistently within acceptable levels
MW-21	Close	Contaminants consistently within acceptable levels
MW96-1	Close	Contaminants consistently within acceptable levels
MW96-2	Close	Insufficient water for sampling
MW99-3	Close	Contaminants consistently within acceptable levels
MW99-4	Monitor and close	Location of previous contamination
MW99-5	Monitor and close	Location of previous contamination
MW99-6	Close	Contaminants consistently within acceptable levels

A one time sampling event is proposed for the following wells due to the presence of historical contamination and to indicate to what extent contamination has decreased: MW-1, MW-10, MW-11, MW-14, MW-17, MW-18, MW-19S, MW99-4, and MW99-5. All samples shall be collected per IDNR and EPA guidance. Prior to collection of each sample, the depth to water shall be measured in each well and used to calculate the volume of standing water. Each well will be purged using a low flow peristaltic pump or





with a dedicated bailer. Groundwater field parameters (pH, specific conductivity, temperature and dissolved oxygen) shall be recorded after each well volume is removed. Each well will be purged until three well volumes have been removed, the field parameters have stabilized, or the well is purged dry. All purge water will be collected and stored in 55-gallon drums and sampled to determine whether it is hazardous or non-hazardous. All necessary quality control samples including duplicates, field blank, trip blank, and lab matrix blank samples will be collected. Approximately 13 samples will be collected in all.

All the wells should be analyzed for the COCs, which include VOC analysis by EPA 8260 and pesticides analysis by EPA 8081-P. All analysis shall be performed by an EPA and State-certified laboratory, with DoD approval, if necessary.

Well Closure Activities

Well closure will begin after the sampling results are received from the lab and after approval to close the wells is obtained from the IDNR. Examining the sampling results will determine the disposition of the purged groundwater (on-site disposal or removal to a licensed hazardous waste facility) during abandonment activities. JMWA will conduct a review of the monitoring wells that were not sampled in the one time monitoring event in order to evaluate current site conditions and document existing well construction data (e.g., well diameter, above or below-ground casing termination, total depth, etc.) This information will be used to ensure that JMWA selects the proper equipment to successfully abandon each well. The well abandonment activities will be performed by a drilling contractor, who is licensed in the State of Iowa, with oversight to be provided by qualified JMWA personnel.

This activity would involve the closure of all 29 monitoring wells (both BRACO and FUDS wells). Most of the wells range from 21 to 31 feet in depth with two deep wells at 45 and 49 feet. Monitoring well closure activities will follow the State of Iowa guidelines in "IAC 567 Chapter 39: Requirements for Properly Plugging Abandoned Wells" and documentation of closure activities shall be on an IDNR well abandonment form. These monitoring wells shall be abandoned by placing sealant material (neat cement or bentonite grout) up to four feet below the ground surface. The sealant material shall be placed by tremie pipe below the groundwater table. Casing pipe and any curbing, frost pit or pump house structure shall be removed to a depth of four feet bgs. The well location should be capped by neat cement, sand cement grout, or concrete terminating four feet below the ground surface.





8.0 REFERENCES

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4th Quarterly Chemical Data Package, Building Site 67 (FUDS), Contract No. DACA45-97-D-0022, Cape Environmental Management, Inc., June 2001.

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APPENDIX A SOIL SAMPLING RESULTS









LOCATION/DATE		SS-138 -ID	SS-138-2	SS-138-3	SS-138-4	SS-138-5	SS-138-10	SS-138-11	SS-138-12	SS-138-13	SS-138-14	SS-138- 15D
	Action Level	Mar. 91	Mar. 91	Mar. 91	Mar. 91	Mar. 91	Oct. 92	Oct. 92	Oct. 92	Oct. 92	Oct. 92	Oct. 92
CONSTITUENT	ug/g	1					1]	<u> </u>			
		<u> </u>			1	BLI	G 138 (VER	SAR)		-		
VOCs				ļ	<u> </u>		<u> </u>		ļ	ļ		
Cis-1,2 Dichloroethene		 	1,7,	\	<u> </u>	3.7.4						
m-xylene		NA	NA	NA	NA	NA	<0.23	0.26	<.23	<.23	<.23	<.23
Acetone						<u> </u>						
Benzene		_										
Carbon Tetreachloride												
Methylene chloride												
Chlorobenzene												
Chloroform												
Dichlorobenzene	1	1			1				 			
Ethylbenzene	t — — —											
Tetrachloroethene	110 ^b											
Toluene		NA	NA	NA	NA	NA	<.10	0.37	<.10	<.10	<.10	<.10
Trichloroethene												
Xylenes (total)												
Pesticides												
Aldrin		<.130	<.130	<.013	<.013	.0254	.00411	.00431	<.0014	<.0014	<.0014	<:0014
Alpha-BHC	0.4	<.025	.0934	<.0025	<.0025	.204	.00759	.0066	<.0028	<.0028	<.0028	.00542
Alpha-Chlordane		<.04	68	<.004	<.004	NA	NA	NA	NA	NA	NA	NA
Alpha-Endosulfan		<.047	<.0047	<.0047	<.0047	.576	<.001	<.001	<.001	<.001	<.001	<.001
Beta-BHC	0.4	<.054	>.125	<.0054	.147	.294	.0119	.0177	<.0077	<.0077	<.0077	.0154
Beta-Endosulfan		<.071	<.0071	<.0071	<.0071	.0125	.00285	.00628	.00103	.00387	<.0007	.00211
Chlordane	0.49											
Delta-BHC	0.4											
Dieldrin	0.36 ^b	<.078	>250	<.0078	<.0078	1.0	.0264	.035	.00479	.00667	<.0016	.0168
Endrin	23											

LOCATION/DATE		SS-138 -1D	SS-138-2	SS-138-3	SS-138-4	SS-138-5	SS-138-10	SS-138-11	SS-138-12	SS-138-13	SS-138-14	SS-138- 15D
	Action Level	Mar. 91	Mar. 91	Mar. 91	Mar. 91	Mar. 91	Oct. 92					
CONSTITUENT	ug/g								<u> </u>			
Endrin Ketone												
Endosulfan Sulfate		<.130	<.026	<.013	<.013	ND	.00248	.00112	ND	ND	ND	ND
Gamma Chlordane		<.21	<.0214	<.0214	<.0214	NA	NA	NA	NA	NA	NA	NA
Heptachlor												
Heptachlor epoxide		<.039	<.0039	<.0039	<.0039	.0169	.00371	.00337	<.0013	.00268	<.0013	<.0013
Isodrin					i							
Lindane	0.1	<.020	<.020	<.020	<.020	.0439	.00182	<.001	<.001	<.001	<.001	.00167
Methoxychlor		<2.10	<.211	<.211	<.211	.189	.0968	<.0359	<.0359	<.0359	<.0359	<.0359
DDD	2.7	<.11	>.25	<.0112	>.25	1.12	.21	.069	.0051	.00386	<.0027	<.0027
DDE	1.9	.33	>.25	.59	>.25	4.46	2.14 E	1.681 E	.0862	.0591	.0259	.99
DDT	1.9	2.4	26	.81	5.4	3.57	3.33 E	1.845 E	.0987	.053	.0425	.95
Herbicides									<u> </u>			 -
2,4,5-T												
2,4,5-TP	780	<.07	<.7	<.00695	<.0695	NA	<.0201	<.0201	<.0201	<.0201	.0252	<.0201
2,4-D												
Dioxins/Furans					 							
TCDD	4.3E-06	4.4E-06	2.63E-05	1.28E-06	4.35E-07	NA	<9.00E-05	1.80E-04	2.00E-04	2.10E-04	<3.20E-04	1.30E-04
TCDF	4.3E-06	5.15E-06	4.22E-05	2.05E-06	1.18E-06	NA	NA	NA	NA	NA	NA	NA
THCDD		9.95E-05	5.46E-04	4.42E-05	5.03E-07	NA	NA	NA	NA	NA	NA	NA
THCDF		1.31E-04	1.13E-04	3.63E-05	6.54E-06	NA	NA	NA	NA	NA	NA	NA
THPCDD		4.35E-04	1.44E-04	8.95E-05	2.78E-05	NA	NA	NA	NA	NA	NA	NA
THPCDF		1.35E-04	7,74E-05	1.22E-05	6.15E06	NA	NA	NA	NA	NA	NA	NA
TOCDD		1.87E-03	2.67E-04	3.31E-04	9.86E-05	NA	NA	NA	NA	NA	NA	NA
TOCDF	 	1.27E-04	6.74E-05	2.95E-05	6.79E-06	NA	NA	NA	NA	NA	NA	NA
TPCDD	1	2.16E-05	7.69E-04	9.36E-07	2.26E-05	NA	NA	NA	NA	NA	NA	NA
TPCDF		6.35E-05	1.41E-04	2.99E-05	3.46E06	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed

ND = Not Detected

b = EPA Region III RBC

E = Estimated value

Action Level = Based on Federal Register, Volume 55, No. 145, Proposed Rules, Appendices A and C.

Bold = Indicates Action level or criteria is exceeded







Soil Sample Results at Bldg 67 Prior to Removal Concentrations in ug/kg Fort Des Moines, Iowa

LOCATION/DATE		SB96 -01	SB96- 05	SB-96- 06	SB96-07	SB96-08
	EPA 3	1996	1996	1996	1996	1996
	RBC	1	1770	1770	1	1550
CONSTITUENT	ug/kg					
			B!	LDG 67 (U	SACE SI)	
VOCs						
Cis-1,2 Dichloroethene						
m-xylene						
Acetone						
Benzene						
Carbon tetrachloride						
Methylene chloride						
Chlorobenzene						
Chloroform						
Dichlorobenzene (total)	***************************************					
Ethylbenzene						
Tetrachloroethene	110,000 ^b			380	190	
Toluene						
Trichloroethene						
Xylenes (total)						
Pesticides		<u> </u>		ļ		
Aldrin		 		ļ		120
Alpha-BHC		 	ļ	 		130
Alpha-Chlordane		}	<u> </u>	ļ		
Alpha-Endosulfan Beta-BHC		 		 	 	550
		ļ				1 220
Beta-Endosulfan	16 000	 	12,000			10,000
Chlordane Delta-BHC	16,000	 	12,000	 		19,000
Delta-BHC Dieldrin	360 ^b	1,100	1,400	 	73	570
Endrin	200	1,100	1,400	 	13	3/0
ERUIII	L	ــــــــــــــــــــــــــــــــــــــ	1		1	







LOCATION/DATE		SB96 -01	SB96- 05	SB-96- 06	SB96-07	SB96-08
	EPA 3 RBC	1996	1996	1996	1996	1996
CONSTITUENT	ug/kg					
Endrin Ketone						
Endosulfan Sulfate						
Gamma Chlordane						
Heptachlor						
Heptachlor epoxide						
Isodrin						
Lindane						
Methoxychlor						
DDD	24,000		5,500			4,300
DDE	17,000		2,300			2,400
DDT	17,000	2,200	26,000			20,000

Notes: NA = Not Analyzed

ND = Not Detected

b = EPA Region III RBC = Risk-based Cleanup levels used by the USACE due to absence of MCLs for soil.

Bold = Indicates Action level or criteria is exceeded



SOIL CONFIRMATION SAMPLES







gamma-Chlordane

Soil

mg/kg <.219

<.022

Confirmation Samples DATA SUMMARY REPORT

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Company: OHM REMEDIATION SERVICES CORP.

					··				
	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	SLCFS 021 JO8410 950925 016187C	SLCFS-022 J08411 950925 016187C	SLCFS-023 JO8412 950925 016187C	SLCFS-024 JO8413 950925 016187C	SLCFS-025 J08414 950925 016187C	SLCFS-026 JO8415 950925 016187C	SLCFS-027 JO8416 950925 016187C	SLCFS-028 JO8417 950925 016187C
Parameters	Units								
Conventional Data	(CV10)								
Solids, Total	8-	75.1	75.7	75.7	77.9	76.8	76.5	76.4	77.7
Priority Pollutant	: Pesticide Analysis,	GC, (GS14)							
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	4.65 41.6 2.30 49.8 <1.10	<.011 .051 .119 1.03 <.011	26.7 7.91 2.24 88.4 <2.16	<1.05 <1.05 <1.05 8.44 <1.05	<.011 <.011 .070 .247 <.011	49.1 36.1 2.99 345 <2.16	103 58.5 12.8 372 <2.13	8.19 <2.13 <2.13 60.2 <2.13
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg mg/kg mg/kg mg/kg ce mg/kg	1.92 92.8 2.48 <1.10 <1.10	.028 .879 .073 .079	5.11 181 3.94 37.3 <2.16	<1.05 28.9 <1.05 3.18 <1.05	<.011 .210 .035 .379 <.011	7.90 249 3.10 208 <2.16	15.9 389 21.9 112 <2.13	3.36 87.0 <2.13 30.6 <2.13
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<1.10 <1.10	<.011 <.011 <.011 <.011	<2.16 <2.16 <2.16 <2.16 <2.16 15.4	<1.05 <1.05 <1.05 <1.05 <1.05	<.011 <.011 <.011 <.011	<2.16 <2.16 8.79 <2.16 34.4	<2.13 <2.13 <2.13 <2.13 <2.13 59.1	<2.13 <2.13 3.70 <2.13 <2.13
Heptachlor Heptachlor epoxic Toxaphene Methoxychlor alpha-Chlordane	mg/kg de mg/kg mg/kg mg/kg mg/kg	6.70 <1.10 <21.9 <1.10 <.219	.012 <.011 <.216 <.011 <.022	9.09 <2.16 <43.1 9.96 <.216	<1.05 <1.05 <21.1 <1.05 <.211	<.011 <.011 <.215 .032 <.011	25.5 <2.16 <43.3 7.08 <.216	39.1 <2.13 <42.6 10.1 <.213	6.36 <2.13 <42.6 <2.13 <.213

<.216

<.211

<.011

< .216

<.213

<.213



Company: OHM REMEDIATION SERVICES CORP.

DATA SUMMARY REPORT

DATE: 10/03/95

	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	SLCFS-029 J08418 950925 016187C	SLCFS-030 J08419 950925 016187C	SLCFS-031 J08420 950925 016187C	SLCFS-032 J08421 950925 016187C	CFS-047 JO8422 950925 016187C	CFS-048 JO8423 950925 016187C	CFS-049 JO8424 950925 016187C	CFS-050 JO8425 950925 016187C
Parameters	Units								
Conventional Data	(CV10)						,		
Solids, Total	8	76.9	77.5	78.5	76.4	84.8	84.2	83.6 ,	83.5
Priority Pollutant	Pesticide Analysis,	GC, (GS14)							
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	6.23 56.6 1.99 67.9 <1.08	.052 .105 .027 1.52	<.011 <.011 .304 .424 <.011	.012 .066 .327 .447	<.01 <.01 <.01 <.097 <.01	<.01 <.01 <.01 <.099 <.01	<.099 <.099 1.10 .982 <.099	<.197 <.197 .872 1.97 <.197
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfate	mg/kg mg/kg mg/kg mg/kg e mg/kg	1.16 75.5 5.60 13.7 <1.08	.190 2.11 .014 1.08 <.011	.075 .306 <.011 .237 <.011	.014 .128 .017 .111	.117 .056 <.01 <.01 <.01	.019 .019 <.01 <.01 <.01	5.51 5.72 <.099 .368 <.099	9.61 12.1 <.197 .236
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<1.08 <1.08 1.08 <1.08 42.3	<.011 <.011 .071 <.011 .094	<.011 <.011 .023 <.011 <.011	<.011 <.011 <.011 <.011 .035	<.01 <.01 <.01 <.01 <.01	<.01 <.01 <.01 <.01 <.01	<.099 <.099 <.099 <.099 <.099	<.197 <.197 <.197 <.197 <.197
Heptachlor Heptachlor epoxide Toxaphene Methoxychlor alpha-Chlordane	mg/kg e mg/kg mg/kg mg/kg mg/kg	12.6 <1.08 <21.6 1.47	.041 <.011 <.211 .175 <.011	<.011 <.011 <.212 <.011 <.011	<.011 <.011 <.213 <.011 <.011	<.01 <.01 <.195 <.01 <.01	<.01 <.01 <.198 <.01 <.01	<.099 <.099 <1.98 <.099 <.099	<.197 <.197 <3.94 <.197 <.197
gamma-Chlordane	mg/kg	<1.08	<.011	<.011	<.011	<.01	<.01	<.099	<.197





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Company: OHM REMEDIATION SERVICES CORP.

Sample Point ID: SLCFS-033
ASC Sample Number: JO8672
Sample Date: 950927
Facility Code: 016187C

Parameters

Units

Priority Pollutant Pesticide Analysis, GC, (GS14)

Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg	1.92 <.104 .442 9.13 <.104
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfate	mg/kg	
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg	<.104 <.104 <.104 <.104 <.359
Heptachlor Heptachlor epoxide Toxaphene Methoxychlor alpha-Chlordane	mg/kg mg/kg	.698 <.104 <2.07 .378 <.104
gamma-Chlordane	mg/kg	< .104



Company: OHM REMEDIATION SERVICES CORP.





DA.E: 10/17/9!

Parameters	Sample Point ID: ASC Sample Number: Sample Date: Facility Code: Units	JO9098 951006	SLCFS-043 JO9099 951006 016187C	SLCFS-044 J09100 951006 016187C	SLCFS-045 JO9101 951006 016187C	SLCFS-046 JO9102 951006 016187C	SLCFS-047 JO9103 951006 016187C
		- 					
Conventional Data	(CV10)						
Solids, Total	9	76.9	75.0	76.3	76.5	75.9	76.3
Total Herbicide An	alysis, GC, (GS02)				•		
2,4-D 2,4,5-T 2,4,5-TP (Silvex)	mg/kg	<.093 <.093 <.093	<.088 <.088 <.088	<.094 <.094 <.094	<.077 <.077 <.077	<.085 <.085 <.085	<.090 <.090 <.090
Priority Pollutant	Pesticide Analysis,	GC, (GS14)					
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg	<.330 <.330 <.330 21.4 <.330	<.016 <.016 .067 1.41 <.016	<.033 <.033 <.033 1.16 <.033	<.008 <.008 <.008 <.167 <.008	<.332 <.332 <.332 6.64 <.332	<.008 <.008 .021 <.165 <.008
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg mg/kg mg/kg mg/kg e mg/kg	1.21 32.9 .624 3.04 <.330	.164 2.38 .025 .502	.229 3.24 <.033 .156 <.033	<.008 <.008 <.008 <.008	.814 21.7 <.332 2.52 <.332	.062 .729 <.008 .139 <.008
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg	<.330 <.330 <.330 <.330 <.330	<.016 .053 <.016 <.016 <.016	<.033 <.033 <.033 <.033 <.033	<.008 <.008 <.008 <.008	<.332 <.332 <.332 <.332 <.332	<.008 <.008 <.008 <.008
Heptachlor Heptachlor epoxid Toxaphene Methoxychlor alpha-Chlordane	mg/kg mg/kg	2.53 <.330 <6.60 <.330 <.330	.058 <.016 <.322 <.016 <.016	.101 <.033 <.654 <.033 <.033	<.008 <.008 <.167 <.008 <.008	<.332 <.332 <6.64 <.332 <.332	<.008 <.008 <.164 <.008 <.008
gamma-Chlordane	mg/kg	<.330	<.016	<.033	<.008	<.332	<.008



DATA SUMMARY REPORT



: 10/17/9

Company: OHM	REMEDIATION	SERVICES	CORP.
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Parameters	Sample Point ID: ASC Sample Number: Sample Date: Facility Code: Units	SLCFS-048 JO9104 951007 016187C	SLCFS-049 JO9105 951007 016187C	SLCFS-050 JO9106 951007 016187C	SLCFS-051 JO9107 951007 016187C	SLCFS-052 JO9108 951007 016187C	SLĆFS-053 JO9109 951007 016187C
			7				
Conventional Data	(CV10)		,				
Solids, Total	ક	77.8	76.0	76.4	78.5	75.7	77.0
Total Herbicide An	alysis, GC, (GS02)						
2,4-D 2,4,5-T 2,4,5-TP (Silvex)	mg/kg		<.098 <.098 <.098	<.086 <.086 <.086	<.085 <.085 <.085	<.094 <.094 <.094	<.092 <.092 <.092
Priority Pollutant	Pesticide Analysis,	GC, (GS14)					
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	<.163 <.163 <.163 6.06 <.163	<.008 <.008 .016 <.165 <.008	<.008 <.008 .014 <.166 <.008	<.164 <.164 <.164 4.32 <.164	<.082 <.082 <.082 .312 <.082	<.033 <.033 <.033 1.07 <.033
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg mg/kg mg/kg mg/kg e mg/kg	.201 4.79 <.163 .441 <.163	<.008 <.008 .013 <.008	<.008 .011 <.008 .012 <.008	.375 5.72 <.164 2.98 <.164	.121 3.42 <.082 .202 <.082	.078 1.65 <.033 .714 <.033
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC		<.163 <.163 <.163 <.163 <.163 .384	<.008 <.008 <.008 <.008 <.008	<.008 <.008 <.008 <.008 <.008	<.164 <.164 <.164 <.164	<.082 <.082 <.082 <.082 <.082	<.033 <.033 <.033 <.033 <.033
Heptachlor Heptachlor epoxid Toxaphene Methoxychlor alpha-Chlordane	le mg/kg	<.163 <.163 <3.27 <.163 <.163	<.008 <.008 <.165 <.008 <.008	<.008 <.008 <.166 <.008 <.008	<.164 <.164 <3.28 .403 <.164	<.082 <.082 <1.64 .189 <.082	<.033 <.033 <.658 <.033 <.033
gamma-Chlordane	mg/kg	<.163	<.008	<.008	<.164	<.082	<.033



DATA SUMMARY REPORT

DA.E: 10/17/9

Company: OHM	REMEDIATION	SERVICES	CORP.
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	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	JO9110 951007	SLCFS-055 J09111 951007 016187C	SLCFS-056 JO9112 951007 016187C	SLCFS-057 J09113 951007 016187C	SLCFS-058 JO9114 951007 016187C	JO9115 951007
Parameters	Units						
Conventional Data	(CV10)				,		
Solids, Total	ģ	76.1	78.3	77.3	76.3	75.7	74.9
Total Herbicide An	nalysis, GC, (GS02)						
2,4-D 2,4,5-T 2,4,5-TP (Silvex)	mg/kg	<.080 <.080 <.080	<.075 <.075 <.075	<.099 <.099 <.099	<.078 <.078 <.078	<.097 <.097 <.097	<.100 <.100 <.100
Priority Pollutant	Pesticide Analysis,	GC, (GS14)					
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg	<.083 <.083 <.083 2.36 <.083	<.008 <.008 .011 <.081 <.008	<.008 <.008 .025 <.163 <.008	<.082 <.082 .098 6.71 <.082	<.033 <.033 .202 3.16 <.033	.021 .172 .069 1.65
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg	.125 3.75 <.083 .233 <.083	<.008 <.008 <.008 .011 <.008	<.008 .111 <.008 .061 <.008	1.13 8.80 <.082 4.28 <.082	.376 5.78 <.033 2.02 <.033	.189 1.80 .018 650
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg		<.008 <.008 <.008 <.008 <.008	<.008 <.008 <.008 <.008 <.008	<.082 <.082 <.082 <.082 <.082	<.033 <.033 .146 <.033 <.033	<.008 <.008 <.008 <.008 .007
Heptachlor Heptachlor epoxid Toxaphene Methoxychlor alpha-Chlordane	mg/kg mg/kg mg/kg mg/kg mg/kg		<.008 <.008 <.162 <.008 <.008	<.008 <.008 <.163 <.008 <.008	.123 <.082 <1.64 .525 <.082	.042 <.033 <.654 .144 <.033	.015 <.008 <.166 .052 <.008
gamma-Chlordane	mg/kg	< .083	< .008	<.008	<.082	<.033	<.008



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	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	JO9116 951007	SLCFS-061 J09117 951007 016187C	SLCFS-062 JO9118 951007 016187C	SLCFS-063 J09119 951007 016187C	SLCFS-064 J09120 951007 016187C	SLCFS-065 JO9121 951009 016187C
Parameter	rs Units						

Company: OHM REMEDIATION SERVICES CORP.

	Sample Number: Sample Date: Facility Code:		JO9117 951007 016187C	JO9118 951007 016187C	JO9119 951007 016187C	JO9120 951007 016187C	JO9121 951009 016187C
Parameters	Units						
Conventional Data	(CV10)						
Solids, Total	१	76.1	70.1	73.9	77.2	77.0	75.8
Total Herbicide Ana	alysis, GC, (GS02)						
2,4-D 2,4,5-T 2,4,5-TP (Silvex)	mg/kg	<.093 <.093 <.093	<.089 <.089 <.089	<.095 <.095 <.095	<.092 <.092 <.092	<.073 <.073 <.073	<.095 <.095 <.095
Priority Pollutant	Pesticide Analysis,	GC, (GS14)				
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	.027 .268 .062 2.47 <.016	.129 .377 .084 4.75 <.083	8.22 <.329 <.329 103 <.329	<.082 <.082 .125 3.50 <.082	<.162 1.18 1.50 37.8 <.162	4.95 20.7 2.05 24.5 18.0
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfate	mg/kg	.276 2.79 <.016 .905 <.016	.546 5.77 .105 1.27	4.54 86.3 1.02 37.2 <.329	.330 5.53 <.082 3.34 <.082	1.60 54.8 4.25 2.89	1.39 45.1 4.30 2.21
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg	<.016 <.016 <.016 <.016	<.083 <.083 <.083 <.083	<.329 <.329 <.329 <.329 <.329	<.082 <.082 <.082 <.082 <.082	<.162 <.162 <.162 <.162 2.18	<.164 <.164 <.164 <.164
Heptachlor Heptachlor epoxide Toxaphene Methoxychlor alpha-Chlordane	e mg/kg mg/kg mg/kg	<.016 <.016 <.327 .074 <.016	.277 <.083 <1.66 .124 <.083	12.0 <.329 <6.58 2.26 <.329	<.082 <.082 <1.64 .357 <.082	3.81 <.162 <3.25 <.162 <.162	3.34 <.164 <3.28 <.164 <.164
gamma-Chlordane	mg/kg	<.016	<.083	<.329	<.082	<.162	<.164



DATA SUMMARY REPORT

A.E: 10/17/9

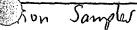
Company:	OHM	REMEDIATION	SERVICES	CORP.
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Paraméters	Sample Point ID: ASC Sample Number: Sample Date: Facility Code: Units	SLCFS-066 JO9122 951009 016187C	SLCFS-067 JO9123 951009 016187C	SLCFS-068 JO9124 951009 016187C	SLCFS-069 JO9125 951009 016187C	SLCFS-070 JO9126 951009 016187C	SLCFS-071 J09127 951009 016187C
Conventional Data	(CV10)	 			· · · · · · · · · · · · · · · · · · ·	<u> </u>	· · · · · · · · · · · · · · · · · · ·
Solids, Total	ą,	76.4	78.0	77.1	76.8	76.6	76.0
Total Herbicide An	alysis, GC, (GS02)						
2,4-D 2,4,5-T 2,4,5-TP (Silvex)	mg/kg mg/kg	<.099 <.099 <.099	<.088 <.088 <.088	<.079 <.079 <.079	<.085<.085<.085	<.087 <.087 <.087	<.094 <.094 <.094
Priority Pollutant	Pesticide Analysis,	GC, (GS14)					
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	<.329 <.329 1.98 50.3 <.329	<.166 <.166 .238 6.52 <.166	<.164 <.164 <.164 1.76 <.164	.857 1.19 .469 15.2 <.326	.140 <.082 .220 6.57 <.082	<.082 <.082 .135 3.22 <.082
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg mg/kg mg/kg mg/kg ce mg/kg	3.75 97.0 4.87 <.329 <.329	.405 6.36 .581 7.97 <.166	1.33 35.4 .196 .651	1.07 30.1 <.326 7.13 <.326	.252 5.46 .115 1.44 <.082	.131 3.54 .169 .822
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<.329 .329</.329</.329</.329</.329</td <td><.166 <.166 .243 <.166 <.166</td> <td><.164 <.164 <.164 <.164 <.164</td> <td><.326 <.326 <.326 <.326 <.524</td> <td><.082 <.082 .119 <.082</td> <td><.082 <.082 <.082 <.082 <.082</td>	<.166 <.166 .243 <.166 <.166	<.164 <.164 <.164 <.164 <.164	<.326 <.326 <.326 <.326 <.524	<.082 <.082 .119 <.082	<.082 <.082 <.082 <.082 <.082
Heptachlor Heptachlor epoxid Toxaphene Methoxychlor alpha-Chlordane	mg/kg de mg/kg mg/kg mg/kg mg/kg mg/kg	10.2 <.329 <6.58 <.329 <.329	.196 <.166 <3.32 .233 <.166	<.164 <.164 <3.29 <.164 <.164	.896 <.326 <6.51 .704 <.326	.179 <.082 <1.64 .183 <.082	.152 <.082 <1.64 .106 <.082
gamma-Chlordane		<.329	<.166	<.164	<.326	<.082	<.082



gamma-Chlordane

il Confir. Ton Samples DATA SUMMARY REPORT Soil



< .033

.010



<.008

<.008

<.008

DATE: 10/02/95

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Company: OHM REMEDIATION SERVICES CORP.

mg/kg <.008

<.008

	l									
	ASC S	Sample Number: Sample Date:	JO8196 950921	CFS-018 JO8197 950921 016187C	CFS-019 JO8198 950921 016187C	CFS-020 JOB199 950921 016187C	CFS-021 JO8200 950921 016187C	CFS-022 JO8201 950921 016187C	BFS-001 JO8202 950921 016187C	BFS-002 JO8203 950921 016187C
	Parameters	Units								
									· · · · · · · · · · · · · · · · · · ·	
	Priority Pollutant Pesti	lcide Analysis, (GC, (GS14)			•				
	Aldrin	mg/kg	<.008	<.008	.009	.008	<.033	<.008	<.008	<.008
	Alpha-BHC			<.008	<.008	<.008	<.033	<.008	<.008	<.008
	Beta-BHC	mg/kg		<.008	.01	<.008	< . 033	< .008	<.008	<.008
ļ	Chlordane			< .083	<.082	<.082	<.332	< . 083	<.082	<.083
	4,4'-DDD	mg/kg	<.008	<.008	<.008	<.008	<.033	<.008	<.008	< .008
	-, -									
	4,4'-DDE	mg/kg	.050	.078	1.05	. 597	2.59	.064	<.008	<.008
	4,4'-DDT	ma/ka	.072	.074	1.21	. 943	1.82	.172	<.008	<.008
	Delta-BHC	mq/kg ·		<.008	<.008	<.008	<.033	<.008	<.008	<.008
	Dieldrin	mg/kg -		<.008	. 023	. 025	<.033	<.008	<.008	<.008
	Endosulfan sulfate	mg/kg «	<.008	<.008	<.008	<.008	<.033	<.008	<.008	<.008
		/1	. 0.00	. 000	- 000	<.008	<.033	<.008	<.008	<.008
1	Endosulfan I			<.008	<.008 <.008	<.008	<.033	<.008	<.008	<.008
1	Endosulfan II			<.008	.014	.017	<.033	<.008	<.008	<.008
	Endrin		<.008		<.008		<.033	<.008	<.008	<.008
Ì	Endrin aldehyde			<.008		<.008	<.033	<.008	<.008	<.008
	Gamma-BHC	mg/kg	<.008	<.008	<.008	<.008	6.033	4.006	4.006	₹.008
	Heptachlor	mg/kg	<.008	< .008	<.008	<.008	< .033	<.008	<.008	<.008
-	Heptachlor epoxide	mg/kg	<.008	<.008	<.008	<.008	<.033	<.008	<.008	<.008
	Toxaphene			<.166	<.163	<.164	< .664	< . 165	< .164	<.166
1	Methoxychlor	mg/kg		<.008	<.008	<.008	<.033	<.008	<.008	<.008
	alpha-Chlordane		<.008	<.008	<.008	<.008	<.033	<.008	<.008	<.008
1	arpiia cirrordane	"9/ N9								

<.008



Company: OHM REMEDIATION SERVICES CORP.

DATA SUM SAY REPORT

<u>E</u>:

10/03/99

	Sample Pos ASC Sample N Sample Facility	Number: Date: Code:	CFS-051 JO8426 950925 016187C	CFS-052 JO8427 950925 016187C	CFS-053 J08428 950925 016187C	CFS-054 J08429 950925 016187C	CFS-055 JO8430 950925 016187C	CFS-056 JO8431 950925 016187C	CFS-057 JO8432 950925 016187C
Parameters	•	Units							
Conventional Data	(CV10)							-	
Solids, Total		\$	83.1	82.6	86.5	85.3	87.2	85.4	85.9 .
Priority Pollutant	Pesticide Ar	nalysis,	GC, (GS14)	,					
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	·	mg/kg mg/kg mg/kg mg/kg mg/kg	<.010 <.010 <.010 <.100 <.010	<1.00 <1.00 3.67 5.60 <1.00	<.019 <.019 <.019 <.189 <.019	<.192 <.192 <.192 <1.92 <.192	<.093 <.093 <.093 <.929 <.093	<.192 <.192 <.192 <1.92 <.192	<.019 <.019 .040 <.191 <.019
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	e	mg/kg mg/kg mg/kg mg/kg mg/kg	.020 .022 <.010 <.010 <.010	45.9 66.7 <1.00 <1.00 <1.00	.753 .557 <.019 <.019 <.019	1.49 1.22 <.192 <.192 <.192	1.40 .717 <.093 <.093 <.093	2.15 .967 <.192 <.192 <.192	1.55 1.47 <.019 .048 <.019
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC		mg/kg mg/kg mg/kg mg/kg mg/kg	<.010 <.010 <.010 <.010 <.010	<1.00 <1.00 <1.00 <1.00 <1.00	<.019 <.019 <.019 <.019 <.019	<.192 <.192 <.192 <.192 <.192	<.093 <.093 <.093 <.093 <.093	<.192 <.192 <.192 <.192 <.192	<.019 <.019 <.019 <.019 <.019
Heptachlor Heptachlor epoxid Toxaphene Methoxychlor alpha-Chlordane	e	mg/kg mg/kg mg/kg mg/kg mg/kg	<.010 <.010 <.200 <.010 <.010	<1.00 <1.00 <20.1 <1.00 <.020	<.019 <.019 <.377 <.019 <.019	<.192 <.192 <3.85 <.192 <.192	<.093 <.093 <1.86 <.093	<.192 <.192 <3.85 <.192 <.192	<.019 <.019 <.383 <.019 <.019
gamma-Chlordane		mg/kg	<.010	<.020	<.019	<.192	<.093	<.192	<.019





DATE: 10/12/95

Company:	OHM	REMEDIATION	SERVICES	CORP.
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	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	CFS-058 JO8466 950926 016187C	CFS-059 JO8467 950926 016187C	CFS-060 JO8468 950926 016187C	CFS-061 JO8469 950926 016187C	CFS-062 JO8470 950926 016187C	CFS-063 J08471 950926 016187C	CFS-064 J08472 950926 016187C	CFS-065 J08473 950926 016187C
Parameters	Units								
conventional Data	(CV10)								
Solids, Total	*	89.0	92.5	78.6	76.8	80.1	77.6	79.2	84.2
'riority Pollutant	Pesticide Analysis,	GC, (GS14)							
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	<.093 <.093 <.093 1.02 <.093	<.018 <.018 <.018 <.179 <.018	<.010 <.010 .014 <.104 <.010	<.215 <.215 <.215 <.215 <2.15 <.215	<.010 <.010 <.010 <.103 <.010	<.011 <.011 <.011 <.107 <.011	<.010 <.010 <.010 <.104 <.010	<.099 <.099 <.099 <.986 <.099
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg mg/kg mg/kg mg/kg e mg/kg	5.23 6.62 <.093 <.093 <.093	1.03 1.89 <.018 <.018 <.018	1.59 1.19 <.010 .012 <.010	4.98 2.75 <.215 <.215 <.215	1.74 1.26 <.010 .029 <.010	.210 .423 <.011 <.011 <.011	.154 .167 <.010 <.010 <.010	2.73 3.89 <.099 <.099
Endosulfan I Endosulfan II Endrin	mg/kg mg/kg	<.093 <.093	<.018 <.018	<.010 <.010	<.215 <.215	<.010 <.010	<.011 <.011	<.010 <.010	<.099 <.099
Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg	<.093 <.093 <.093	<.018 <.018 <.018	<.010 <.010 <.010	<.215 <.215 <.215	<.010 <.010 <.010	<.011 <.011 <.011	<.010 <.010 <.010	<.099 <.099 <.099
	mg/kg mg/kg mg/kg	< .093	<.018	<.010 <.010	<.215 <.215	<.010 <.010	<.011 <.011	<.010 <.010	<.099



DATA SUMMARY REPORT



DATE: 10/12/95

Company:	OHM	REMEDIATION	SERVICES	CORP.
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	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	CFS-066 J08474 950926 016187C	CFS-067 JO8475 950926 016187C	CFS-068 J08440 950926 016187C	CFS-069 J08441 950926 016187C	CFS-070 J08442 950926 016187C	CFS-071 JO8443 950926 016187C	CFS-072 J08444 950926 016187C	CFS-073 J08445 950926 016187C
Parameters	Units			,					•
onventional Data	(CV10)								
Solids, Total	ક	79.2	78.6	79.9	76.3	80.7	83.3	90.1 .	88.6
riority Pollutant	Pesticide Analysis,	GC, (GS14)							
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	<.105 <.105 <.105 <1.05 <1.05 <.105	<.010 <.010 .020 <.105 <.010	<.010 <.010 <.010 <.103 <.010	<.011 <.011 .017 <.109 <.011	<.010 <.010 .021 <.102 <.010	<.992 <.992 4.33 <9.92 6.38	<.009 <.009 .027 <.181 <.009	<.919 <.919 3.76 6.43 <.919
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg mg/kg mg/kg mg/kg e mg/kg	10.2 . 6.45 <.105 <.105 <.105	2.43 1.69 <.010 .021 <.010	.285 .325 <.010 <.010 <.010	1.84 1.35 <.011 .016 <.011	1.48 1.31 <.010 .034 <.010	14.7 25.7 <.992 4.86 <.992	.404 .332 <.009 .093 <.009	34.4 48.0 <.919 3.96 <.919
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<.105 <.105 <.105 <.105 <.105 <.105	<.010 <.010 .015 <.010 <.010	<.010 <.010 <.010 <.010 <.010	<.011 <.011 <.011 <.011 <.011	<.010 <.010 <.010 <.010 <.010	<.992 <.992 <.992 <.992 <.992	<.009 <.009 <.009 <.009 <.009	<.919 <.919 <.919 <.919 <.919 <.919
Heptachlor Heptachlor epoxide Toxaphene Methoxychlor alpha-Chlordane	mg/kg mg/kg	<.105 <.105 <2.09 <.105 <.105	<.010 <.010 <.209 <.010 <.010	<.010 <.010 <.207 <.010 <.010	<.011 <.011 <.217 <.011 <.011	<.010 <.010 <.205 <.010 <.010	<.992 <.992 <19.8 <.992 <.992	<.009 <.009 <.181 <.009 <.009	<.919 <.919 <18.4 <.919 <.919
gamma-Chlordane	mg/kg	<.105	<.010	<.010	<.011	<.010	<.992	<.009	<.919





DATA SUMMARY REPORT

PATE: 10/12/95

Company:	OHM	REMEDIATION	SERVICES	CORP.

•	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	CFS-074 J08446 950926 016187C	CFS-075 J08447 950926 016187C	CFS-076 JO8448 950926 016187C	CFS-077 JO8449 950926 016187C	CFS-078 JO8450 950926 016187C	CFS-079 J08451 950926 016187C	CFS-080 JO8452 950926 016187C	CFS-081 JO8453 950926 016187C
Parameters	Units								
Conventional Data	(CV10)								
Solids, Total	8	85.6	87.3	87.4	76.9	84.9	75.9	80.8	77.2
?riority Pollutant	Pesticide Analysis,	GC, (GS14)							
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	<.385 <.385 1.28 <3.85 10.8	<.094 <.094 .294 <.943 <.094	<.189 <.189 .332 <1.89 <.189	<1.06 <1.06 1.57 <10.6 24.3	<.973 6.54 54.1 33.5 <.973	<1.06 <1.06 <1.06 3.19 <1.06	<1.02 <1.02 14.7 <10.2 22.9	<1.07 <1.07 <1.07 <10.7 9.35
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg mg/kg mg/kg mg/kg e mg/kg	18.8 28.2 <.385 .558 <.385	3.94 7.03 <.094 .159 <.094	2.66 4.96 <.189 <.189 <.189	17.6 44.8 <1.06 1.65 <1.06	15.5 97.1 4.77 3.98 <.973	17.4 32.3 <1.06 <1.06 <1.06	2.64 56.9 <1.02 2.35 <1.02	6.69 24.3 <1.07 <1.07 <1.07
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<.385 <.385 <.385 <.385 <.385	<.094 <.094 <.094 <.094 <.094	<.189 <.189 <.189 <.189 <.189	<1.06 <1.06 <1.06 <1.06 <1.06	<.973 <.973 1.09 <.973 4.14	<1.06 <1.06 <1.06 <1.06 <1.06	<1.02 <1.02 <1.02 <1.02 <1.02	<1.07 <1.07 <1.07 <1.07 <1.07
Heptachlor Heptachlor epoxid Toxaphene Methoxychlor alpha-Chlordane	mg/kg mg/kg mg/kg mg/kg mg/kg	<.385 <.385 <7.69 <.385 <.385 <.385	<.094 <.094 <1.89 <.094 <.094	<.189 <.189 <3.77 <.189 <.189	<1.06 <1.06 <21.3 <1.06 <1.06	2.39 1.36 <19.5 <.973 <.973	<1.06 <1.06 <21.3 <1.06 <1.06	<1.02 <1.02 <20.3 <1.02 <1.02	<1.07 <1.07 <21.4 <1.07 <1.07
gamma-Chlordane	mg/kg	<.385	<.094	<.189	<1.06	<.973	<1.06	<1.02	<1.07





Data Summary Report

DATE: 10/12/95

Company: C	MHC	REMEDIATION	SERVICES	CORP.
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	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	CFS-082 JO8454 950926 016187C	CFS-083 JO8455 950926 016187C	CFS-084 JO8456 950926 016187C	CFS-085 JO8457 950926 016187C	CFS-086 JO8458 950926 016187C	CFS-087 JO8459 950926 016187C	CFS-088 J08460 950926 016187C	CFS-089 JO8461 950926 016187C
Parameters	Units								
Conventional Data	(CV10)								
Solids, Total	*	81.8	77.1	79.6	83.1	82.9	87.8	89.5	89.1
Priority Pollutant	Pesticide Analysis,	GC, (GS14)							
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	<.010 <.010 .469 <.100 <.010	<1.06 <1.06 2.90 <10.6 22.7	<1.03 <1.03 13.5 <10.3 19.4	<.992 <.992 <.992 <9.92 8.91	<.099 <.099 .206 <.992 <.099	<.926 <.926 <.926 <9.26 <.926	<.009 .026 .044 <.182 .098	<.019 <.019 .117 .224 <.019
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfate	mg/kg mg/kg mg/kg mg/kg mg/kg	.110 .362 <.010 .011 <.010	8.13 65.6 <1.06 <1.06 <1.06	2.07 55.1 <1.03 <1.03 <1.03	12.5 23.3 <.992 <.992 <.992	2.10 4.60 <.099 <.099 <.099	27.5 69.4 <.926 <.926 <.926	.139 .195 <.009 .014 <.009	1.62 2.52 <.019 .088 <.019
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<.010 <.010 <.010 <.010 <.010	<1.06 <1.06 <1.06 <1.06 <1.06	<1.03 <1.03 <1.03 <1.03 <1.03	<.992 <.992 <.992 <.992 <.992	<.099 <.099 <.099 <.099 <.099	<.926 <.926 <.926 <.926 <.926	<.009 <.009 <.009 <.009 <.009	<.019 <.019 .019 <.019 <.019
Heptachlor Heptachlor epoxide Toxaphene Methoxychlor alpha-Chlordane	mg/kg e mg/kg mg/kg mg/kg mg/kg	<.010 <.010 <.201 <.010 <.010	<1.06 <1.06 <21.2 <1.06 <1.06	<1.03 <1.03 <20.6 <1.03 <1.03	<.992 <.992 <19.8 <.992 <.992	<.099 <.099 <1.98 <.099 <.099	<.926 <.926 <18.5 <.926 <.926	<.009 <.009 <.182 <.009 <.009	<.019 <.019 <.373 <.019 <.019
gamma-Chlordane	mg/kg	<.010	<1.06	<1.03	<.992	<.099	<.926	<.009	<.019





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DA. ..: 10/18/95

Company: OHM REMEDIATION SERVICES CORP.

	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:		CFS-091 JO8789 951003 016187C	CFS-092 JO8790 951003 016187C	CFS-093 JO8791 951003 016187C	CFS-094 JO8792 951003 016187C	CFS-095 JO8793 951003 016187C
Parameters	Units			•			
Conventional Data (CV10)						
Solids, Total	\$	84.5	82.6	74.0	82.8	85.4	85.0
riority Pollutant	Pesticide Analysis,	GC, (GS14))				
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	<.033 <.033 <.033 <.327 <.033	<.008 <.008 <.008 <.083 <.008	<.082 <.082 <.082 <.821 <.082	<.01 <.01 .017 <.10 <.01	<.008 <.008 <.008 <.083 <.008	<.008 <.008 <.008 <.081 <.008
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfate	mg/kg mg/kg mg/kg mg/kg mg/kg	1.42 2.09 <.033 .055 <.033	.01 .029 <.008 <.008 <.008	2.72 3.70 <.082 <.082 <.082	<.01 .040 <.01 <.01 <.01	.103 .057 <.008 <.008 <.008	.067 .024 <.008 <.008 <.008
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<.033 <.033 <.033 <.033 <.033	<.008 <.008 <.008 <.008 <.008	<.082 <.082 <.082 <.082 <.082	<.01 <.01 <.01 <.01 <.01	<.008 <.008 <.008 <.008 <.008	<.008 <.008 <.008 <.008 <.008
Heptachlor Heptachlor epoxide Toxaphene Endrin ketone Methoxychlor	mg/kg mg/kg mg/kg mg/kg mg/kg	<.033 <.033 <.654 <.033 <.033	<.008 <.008 <.167 <.008 <.008	<.082 <.082 <1.64 <.082 <.082	<.01 <.01 <.199 <.01 <.01	<.008 <.008 <.165 <.008 <.008	<.008 <.008 <.163 <.008 <.008
alpha-Chlordane gamma-Chlordane	mg/kg mg/kg	<.033 .051	<.008 <.008	<.082 <.082	<.01 <.01	<.008 <.008	<.008 <.008



Company: OHM REMEDIATION SERVICES CORP.





.: 10/18/95

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Parameters	Sample Point ID: ASC Sample Number: Sample Date: Facility Code: Units	CFS-096 JO8849 951004 016187C	CFS-097 JO8850 951004 016187C	CFS-098 JO8851 951004 016187C	CFS-099 JO8852 951004 016187C	CFS-100 JO8853 951004 016187C
Conventional Data (Cirl 0)					
Conventional Data (CV107					
Solids, Total	Q.	83.8	84.0	83.5	88.3	88.6
Priority Pollutant	Pesticide Analysis,	GC, (GS14)	1			
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD		<.008 <.008 .008 <.083 <.008	<.008 <.008 .025 <.083 <.008	<.008 <.008 .025 <.083 <.008	<.008 <.008 .039 <.083 <.008	<.008 <.008 .010 <.083 <.008
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfate	mg/kg	.226 .297 <.008 <.008	.492 .489 <.008 .028 <.008	.510 .505 <.008 .019 <.008	.557 .546 <.008 <.008 <.008	.620 .637 <.008 <.008 <.008
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg	<.008 <.008 <.008 <.008 <.008	<.008 <.008 <.008 <.008	<.008 <.008 <.008 <.008 <.008	<.008 <.008 <.008 <.008 <.008	<.008 <.008 <.008 <.008 <.008
Heptachlor Heptachlor epoxide Toxaphene Methoxychlor alpha-Chlordane	mg/kg	<.008 <.008 <.166 <.008 <.008	<.008 <.008 <.166 <.008 <.008	<.008 <.008 <.167 <.008 <.008	<.008 <.008 <.166 <.008 <.008	<.008 <.008 <.166 <.008 <.008
gamma-Chlordane	mg/kg	<.008	<.008	<.008	<.008	<.008



DALE: 10/12/

Company:	OHM	REMEDIATION	SERVICES	CORP.
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A	Sample Point ID: SC Sample Number: Sample Date: Facility Code:	CFS-101 JO8889 951005 016187C	CFS-102 JO8890 951005 016187C	CFS-103 JO8891 951005 016187C	CFS-104 JO8892 951005 016187C	CFS-105 J08893 951005 016187C	CFS-106 JO8894 951005 016187C	CFS-107 J08895 951005 016187C	CFS-108 J08896 951005 016187C
Parameters	Units		,						
Conventional Data (C	V10)								
Solids, Total	કૃ	80.4	77.1	79.8	75.6	78.9	80.1	84.1	86.3
Priority Pollutant P	esticide Analysis,	GC, (GS14)						
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	<.010 <.010 <.010 <.205 <.010	<.011 <.011 <.011 <.021 <.011	<.017 <.017 <.017 <.166 <.017	<.011 <.011 <.011 <.218 <.011	<.010 <.010 <.010 <.206 <.010	<.103 <.103 <.103 <.227 <.103	<.01 <.01 .070 <.193 <.01	188 5.92 17.1 <19.2 <1.92
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfate	mg/kg mg/kg mg/kg mg/kg mg/kg	.051 .152 <.010 <.010 <.010	.585 .645 <.011 <.011	.467 .327 <.017 <.017 <.017	.777 .712 <.011 <.011 <.011	.529 .441 <.010 <.010 <.010	7.14 3.87 <.103 <.103 <.103	.490 .463 <.01 .051	32.0 174 <1.92 25.9 <1.92
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<.010 <.010 <.010 <.010 <.010	<.011 <.011 <.011 <.011 <.011	<.017 <.017 <.017 <.017 <.017	<.011 <.011 <.011 <.011 <.011	<.010 <.010 <.010 <.010 <.010	<.103 <.103 <.103 <.103 <.103	<.01 <.01 <.01 <.01 <.01	<1.92 <1.92 <1.92 <1.92 <1.92
Heptachlor Heptachlor epoxide Toxaphene Methoxychlor alpha-Chlordane	mg/kg mg/kg mg/kg mg/kg mg/kg	<.010 <.010 <.205 <.010 <.010	<.011 <.011 <.214 <.011 <.011	<.017 <.017 <.332 <.017 <.017	<.011 .029 <.217 <.011 <.011	<.010 <.010 <.207 <.010 <.010	<.103 <.103 <2.06 <.103 <.103	<.01 <.01 <.193 <.01 <.01	<1.92 <1.92 <38.3 <1.92
gamma-Chlordane	mg/kg	<.010	<.011	<.017	<.011	<.010	<.103	<.01	2.30





Date

: 10/10/95

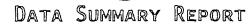
PAGE: 1

Company:	OHM	REMEDIATION	SERVICES	CORP.
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	Sample Point ID: ASC Sample Number: Sample Date: Facility Code:	CFS-109 J08897 951005 016187C	CFS-110 J08898 951005 016187C	CFS-111 J08899 951005 016187C	CFS-112 JO8900 951005 016187C	CFS-113 JO8901 951005 016187C	CFS-114 J08902 951005 016187C	CFS-115 JO8903 951005 016187C	CFS-116 JO8904 951005 016187C
Parameters	Units								
Conventional Data	(CV10)					,			
Solids, Total	왐	84.1	81.9	82.0	80.7	81.9	78.0	82.9	77.9
Priority Pollutant	Pesticide Analysis,	GC, (GS14)							•
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	mg/kg mg/kg mg/kg mg/kg mg/kg	.012 <.01 .028 <.097 <.01	<.01 <.01 <.01 <.199 <.01	<.100 2.46 12.9 <.201 <.100	<.103 .289 3.35 <.206 <.103	<.101 .379 4.11 <.201 <.101	<.011 .077 .485 <.213 <.011	<.01 .101 .433 <.198 <.01	<.011 .065 .196 <.210 <.011
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfat	mg/kg mg/kg mg/kg mg/kg e mg/kg	.069 .119 <.01 <.01 <.01	1.02 1.98 <.01 <.01 <.01	1.05 2.42 <.100 .736 <.100	1.49 6.10 <.103 <.103 <.103	1.54 9.41 .176 <.101 <.101	.111 .262 <.011 .078 <.011	.050 .343 <.01 .030	.022 .055 <.011 <.011 <.011
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	mg/kg mg/kg mg/kg mg/kg mg/kg	<.01 <.01 <.01 <.01	.024 <.01 <.01 <.01 <.01	<.100 <.100 <.100 <.100	<.103 <.103 <.103 <.103 .290	<.101 <.101 <.101 <.101 .346	<.011 <.011 <.011 <.011 .017	<.01 <.01 <.01 <.01	<.011 <.011 <.011 <.011 <.011
Heptachlor Heptachlor epoxid Toxaphene Methoxychlor alpha-Chlordane	mg/kg mg/kg mg/kg mg/kg mg/kg	<.01 <.01 <.194 <.01 <.01	<.01 <.01 <.199 <.01 <.01	<.100 <.100 <2.01 <.100 <.100	<.103 <.103 <2.06 <.103 <.103	<.101 <.101 <2.02 <.101 <.101	<.011 <.011 <.213 <.011 <.011	<.01 <.01 <.198 <.01 <.020	<.011 <.011 <.210 <.011 <.021
gamma-Chlordane	mg/kg	<.01	<.01	<.100	<.103	<.101	<.011	<.020	<.021



Company: OHM REMEDIATION SERVICES CORP.



-(1)

DATE: 10/12/95

PAGE: 1

Parameters	Sample Point ASC Sample Num Sample D Facility C	ber: ate:	CFS-117 JO8905 951005 016187C	CFS-118 JO8906 951005 016187C	CFS-119 JO8907 951005 016187C	CFS-120 JO8908 951005 016187C	CFS-121 JO8909 951005 016187C	CFS-122 JO8910 951005 016187C
Conventional Data	(CV10)							
Solids, Total	ક		87.0	75.6	84.4	81.5	82.6	81.3
Priority Pollutant	Pesticide Anal	ysis,	GC, (GS14)	•				
Aldrin Alpha-BHC Beta-BHC Chlordane 4,4'-DDD	m m	ng/kg ng/kg ng/kg	<.01 <.01 .020 <.190 <.01	<.110 <.110 .284 .485 <.110	<.01 <.01 .106 <.190 <.01	<.010 .042 .270 <.201 <.010	<.01 <.01 .020 <.196 <.01	<.01 <.01 .025 <.196 <.01
4,4'-DDE 4,4'-DDT Delta-BHC Dieldrin Endosulfan sulfate	ព ព ព	ng/kg ng/kg ng/kg ng/kg ng/kg	<.01 .024 <.01 <.01 <.01	3.99 8.26 <.110 .302 <.110	1.08 1.08 <.01 .016 <.01	1.73 3.56 <.010 .036 <.010	.184 .311 <.01 .032	.622 1.08 <.01 .090
Endosulfan I Endosulfan II Endrin Endrin aldehyde Gamma-BHC	m 	ng/kg ng/kg ng/kg ng/kg ng/kg	<.01 <.01 <.01 <.01 <.01	<.110 <.110 <.110 <.110 <.110	<.01 <.01 <.01 <.01 <.01	<.010 <.010 <.010 <.010 <.010	<.01 <.01 <.01 <.01 <.01	<.01 <.01 <.01 <.01 <.01
Heptachlor Heptachlor epoxide Toxaphene Methoxychlor alpha-Chlordane	e ព ក ក	ng/kg ng/kg ng/kg ng/kg ng/kg	<.01 <.01 <.190 <.01 <.01	<.110 <.110 <2.20 <.110 <.110	<.01 <.01 <.191 <.01 <.01	<.010 <.010 <.201 <.010 <.010	<.01 <.01 <.196 <.01 <.020	<.01 <.01 <.196 <.01 <.020
gamma-Chlordane	π	ng/kg	<.01	<.110	<.01	<.010	<.020	<.020

DATA SUMMARY REPORT

<.020

DATE: 10/10/95

BY:Xerox Telecopier

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515 285 0692:第4

PAGE: 1

Company: OHM REMEDIATION SERVICES CORP.

Bamplo Point ID: CVS-121 ASC Sample Number: J08909 Sample Date: 951005 Facility Code: 016187C CF8-122 J08910 951005 015187C

mg/kg <.020

Parameters

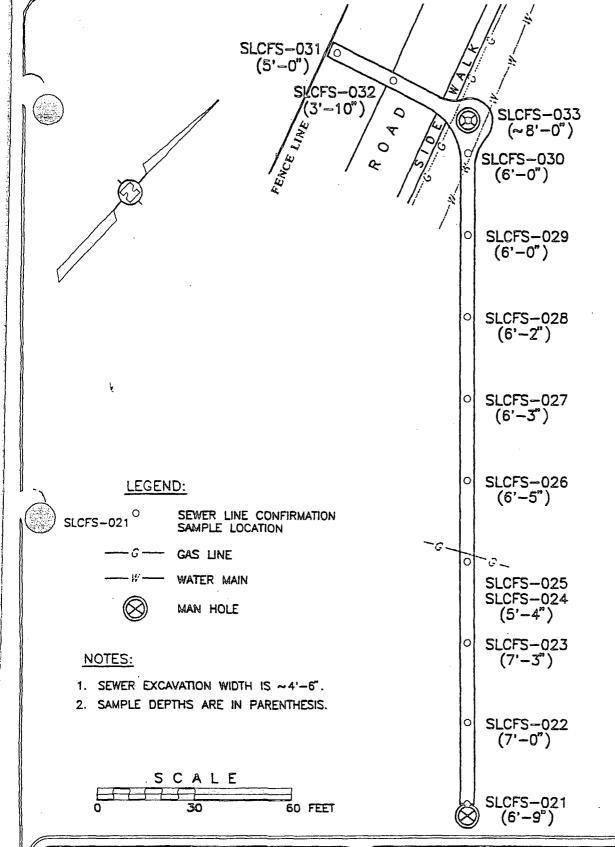
gamma-Chlordane

Units

Solids,	Total		В	82.6	81.3
---------	-------	--	---	------	------

Priority Poliutost Posticido Amalycia, OC, (GS14)

Aldrin	mg/kg	<.01	<.01
Alpha-BBC		<.01	<.01
Beta-BRC		.020	.025
Chlordane		<.196	<.196
4,4'-DDD		<.01	<.01
4,4'-DDE 4,4'-DDT Pelta-BHC Dieldrin Endosulfan sulfate	mg/kg mg/kg mg/kg mg/kg mg/kg	.186 .311 <.01 .032 <.01	.622 2.08 <.01 .090
Endosulfan I	mor/kor	<.01	<.01
Endosulfan II		<.01	<.01
Endrin		<.01	<.01
Endrin aldehyde		<.01	<.01
Gamma-EHC		<.01	<.01
Reptachlor Reptachlor epoxide Tonaphene Methonychlor alpha-Chlordane	mg/kg mg/kg mg/kg mg/kg mg/kg	<.196 <.01	<.01 <.01 <.196 <.01 <.020





OHM Remediation Services Corp.

OHM Project No. 16187

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1.1. 2.7 2.6.)rawn By: B.O'Connor	Checked By: P.Conley	Approved By:
	Date: 11/14/95	Scale:	Drawing No.
√ '	11/14/95	AS SHOWN	16187-412

FIGURE 4.2

FIRST ROUND CONFIRMATION SAMPLE LOCATIONS
AFTER SEWER LINE REMOVAL
FORT DES MOINES
DES MOINES, IOWA

PREPARED FOR

USACE

OMAHA, NEBRASKA

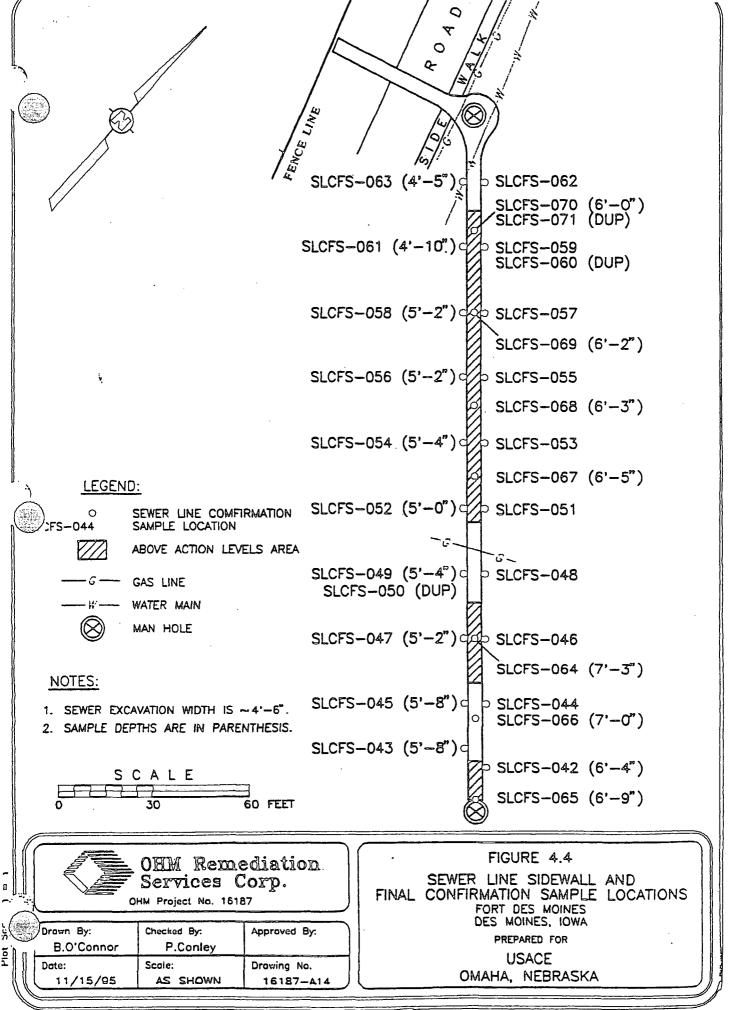
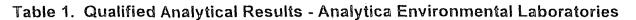


Table 1. Qualified Analytical Results - Analytica Environmental Laboratories

SDG -		METHOD	DATE		LAB			LAB	VALIDATION	REPORTING
LABSAMPID	LOCID	CODE	COLL.	ANALYTE	NOTATION	RESULT	UNITS	FLAGS	QUALIFIER	LIMIT
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	2,4,6-TRICHLOROPHENOL	ND .	0	UG/KG-DRY		RS4	350
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	2,4-DICHLOROPHENOL	ND	. 0	UG/KG-DRY		RS4	350
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	2,4-DIMETHYLPHENOL	ND	, 0	UG/KG-DRY	1	RS4	350
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	2,4-DINITROPHENOL	ND	0	UG/KG-DRY		RS4	3500
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	2-CHLOROPHENOL	ND	0	UG/KG-DRY		RS4	350
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	2-METHYLPHENOL	ND	0	UG/KG-DRY		RS4	350
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	2-NITROPHENOL	ND	0	UG/KG-DRY		RS4	350
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	4,6-DINITRO-2-METHYLPHENOL	ND .	0	UG/KG-DRY	1	RS4	3500
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	4-CHLORO-3-METHYLPHENOL	ND	0	UG/KG-DRY		RS4	350
9908203-02B	SUBBASE COURSE .	SW 8270C	8/19/99	4-METHYLPHENOL	ND	. 0	UG/KG-DRY		RS4 ·	350
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	4-NITROPHENOL	ND	0	UG/KG-DRY		RS4	3500
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	BENZOIC ACID	ND	0	UG/KG-DRY		RS4	3500
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	BENZYL ALCOHOL	ND	0	UG/KG-DRY		RS4	700
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	BUTYLBENZYLPHTHALATE	TR	76	UG/KG-DRY	DB	UB37	1100
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	PENTACHLOROPHENOL	ND .	0	UG/KG-DRY		RS4	1400
9908203-02B	SUBBASE COURSE	SW 8270C	8/19/99	PHENOL	ND	0	UG/KG-DRY		RS4	350
							·			
9908204-01A	BACKFILL	SW 8151A	8/19/99	2,4,5-T	ND	0	UG/KG-DRY		RS8	4
9908204-01A	BACKFILL.	SW 8151A	8/19/99	2,4-D	ND	0	UG/KG-DRY		JS24	. 40
9908204-01A	BACKFILL .	SW 8151A		2,4-DB .	ND	0	UG/KG-DRY		JS23	40
9908204-01A	BACKFILL	SW 8151A	8/19/99	DALAPON	ND .	0	UG/KG-DRY		JS20L23	100
9908204-02A	SUBBASE COURSE	SW 8151A	8/19/99	DALAPON	ND	0	UG/KG-DRY		JL23	100
9908204-03A	SURFACE COURSE	SW 8151A	8/19/99	DALAPON	ND	. 0	UG/KG-DRY		JL23	100

Soil Confirmation Samples

9909021-01A	WALL EAST	SW 8081A	8/31/99 ENDRIN ALDEHYDE	ND	0	UG/KG-DRY	T	JL44	4
9909021-02A	WALL WEST	SW 8081A	8/31/99 BETA-BHC	[= ·	69	UG/KG-DRY	D	JC16	11
9909021-02A	WALL WEST	SW 8081A	8/31/99 ENDRIN ALDEHYDE	ND	0	UG/KG-DRY		JL44	19
9909021-03A	WALL NORTH	SW 8081A	8/31/99 ENDRIN ALDEHYDE	ND	0	UG/KG-DRY		JL44	4.1
9909021-04A	WALL SOUTH	SW 8081A	8/31/99 ENDRIN ALDEHYDE	ND	0	UG/KG-DRY		JL44	4.1
9909021-05A	BOTTOM SOUTH	SW 8081A	8/31/99 ENDRIN ALDEHYDE	ND	0	UG/KG-DRY		JL44	3.9
9909021-06A	BOTTOM MIDDLE SOUTH	SW 8081A	8/31/99 ENDRIN ALDEHYDE	ND	0	UG/KG-DRY	1	JL44	39
9909021-07A	BOTTOM MIDDLE NORTH	SW 8081A	8/31/99 ENDRIN ALDEHYDE	ND	0	UG/KG-DRY		JL44	3.9
9909021-08A	BOTTOM NORTH .	SW 8081A	8/31/99 4,4'-DDD	=	18	UG/KG-DRY	D	JS319	9
9909021-08A	BOTTOM NORTH .	SW 8081A	8/31/99 4,4'-DDE	= .	7.2	UG/KG-DRY	D	JS524D67	6
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99 4,4'-DDT	=	55	UG/KG-DRY	D	JS216D107	7.2
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99 ALDRIN	=	47	UG/KG-DRY	D	JC18D97	3.6



SDG -		METHOD	DATE.		LAB			LAB	VALIDATION	REPORTING
LABSAMPID	LOCID	CODE	COLL	ANALYTE	NOTATION	RESULT	UNITS	FLAGS	QUALIFIER	LIMIT
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	ALPHA-BHC	=	17	UG/KG-DRY	D	JS58D124	6.8
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	ALPHA-CHLORDANE	= '	31	UG/KG-DRY	D	JS0D67	5.4
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	DELTA-BHC	=	11	UG/KG-DRY	D	JS538D102	9
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	DIELDRIN	=	34	UG/KG-DRY	D	JS319D65	5.4
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	ENDOSULFAN I	ND	. 0	UG/KG-DRY		JD49	3
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	ENDOSULFAN II	ND-	0	UG/KG-DRY		JD50	6
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	ENDOSULFAN SULFATE .	ND	0	UG/KG-DRY		JD46	·) 310
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	ENDRIN ALDEHYDE	ND	Ō	UG/KG-DRY		JL44	11
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	GAMMA-BHC (LINDANE)	=	19	UG/KG-DRY	D	JS638D140	7.9
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	GAMMA-CHLORDANE	=	21	UG/KG-DRY	D	JS938D109	3.6
9909021-08A	BOTTOM NORTH	SW 8081A	8/31/99	HEPTACHLOR .	=	17	UG/KG-DRY	D	JS575D112	3.6

LAB NOTATIONS

ND = Not Detected

TR = Trace, less than RL, greater than MDL

VALIDATION QUALIFIERS

EPA Qualifier

U= undetected

J = estimated R = rejected

Reason for Qualification

B = blank contamination

C = calibration response factor or % RSD

S = spike recovery from surrogate or matrix spike

P = two column confirmation difference > 40%

D = duplicate precision RPD

L = Laboratory Control Sample %R

1 = Internal Standard

LAB QUALIFIERS

B (inorganic) and J (organic) = value is > MDL < Reporting Limit

B (organics) = detected in the method blank

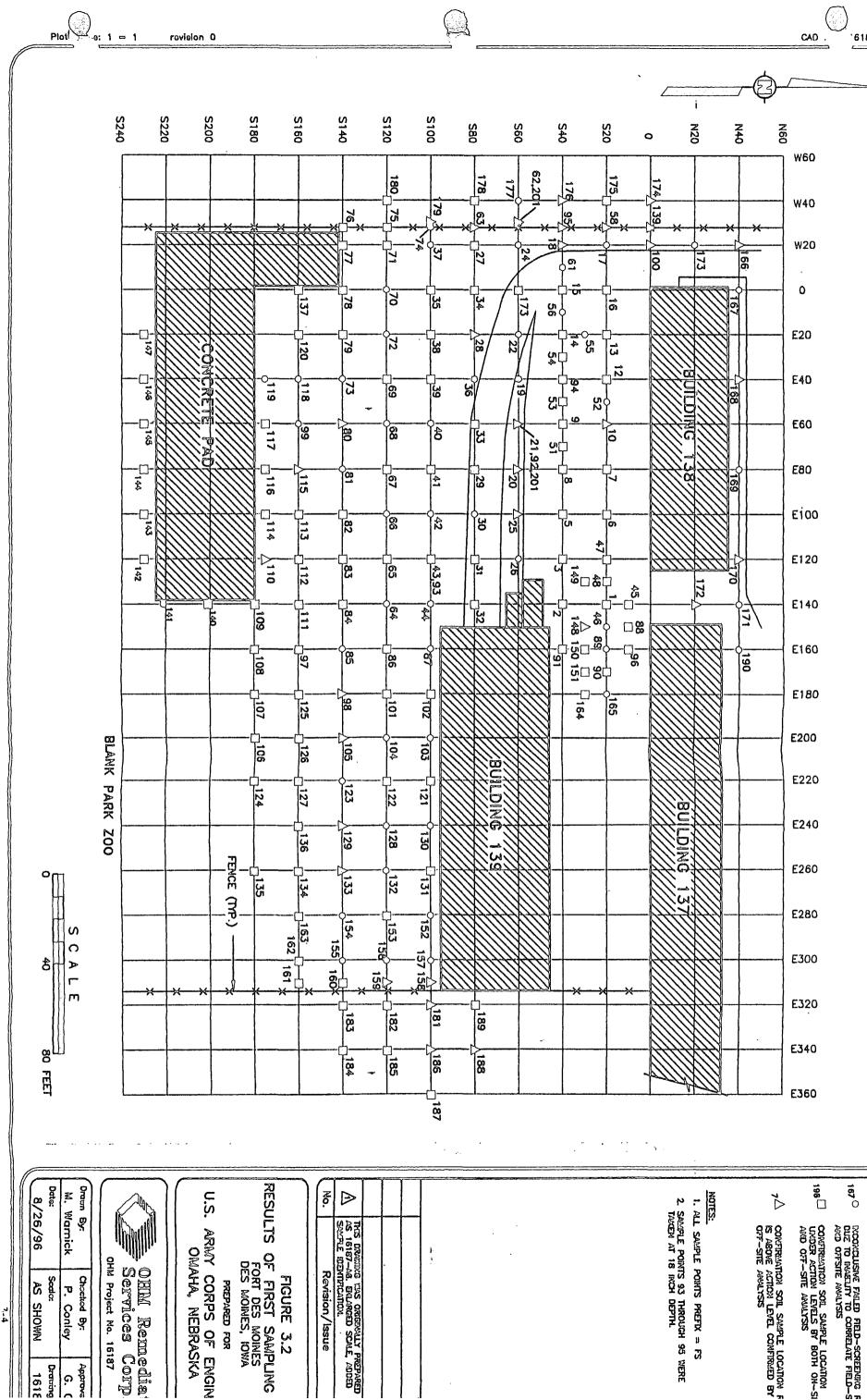
D = diluted sample

Units - ug/l = micrograms per liter

ug/kg = micrograms per kilogram

mg/l = milligrams/liter

mg/kg = milligrams per kilogram



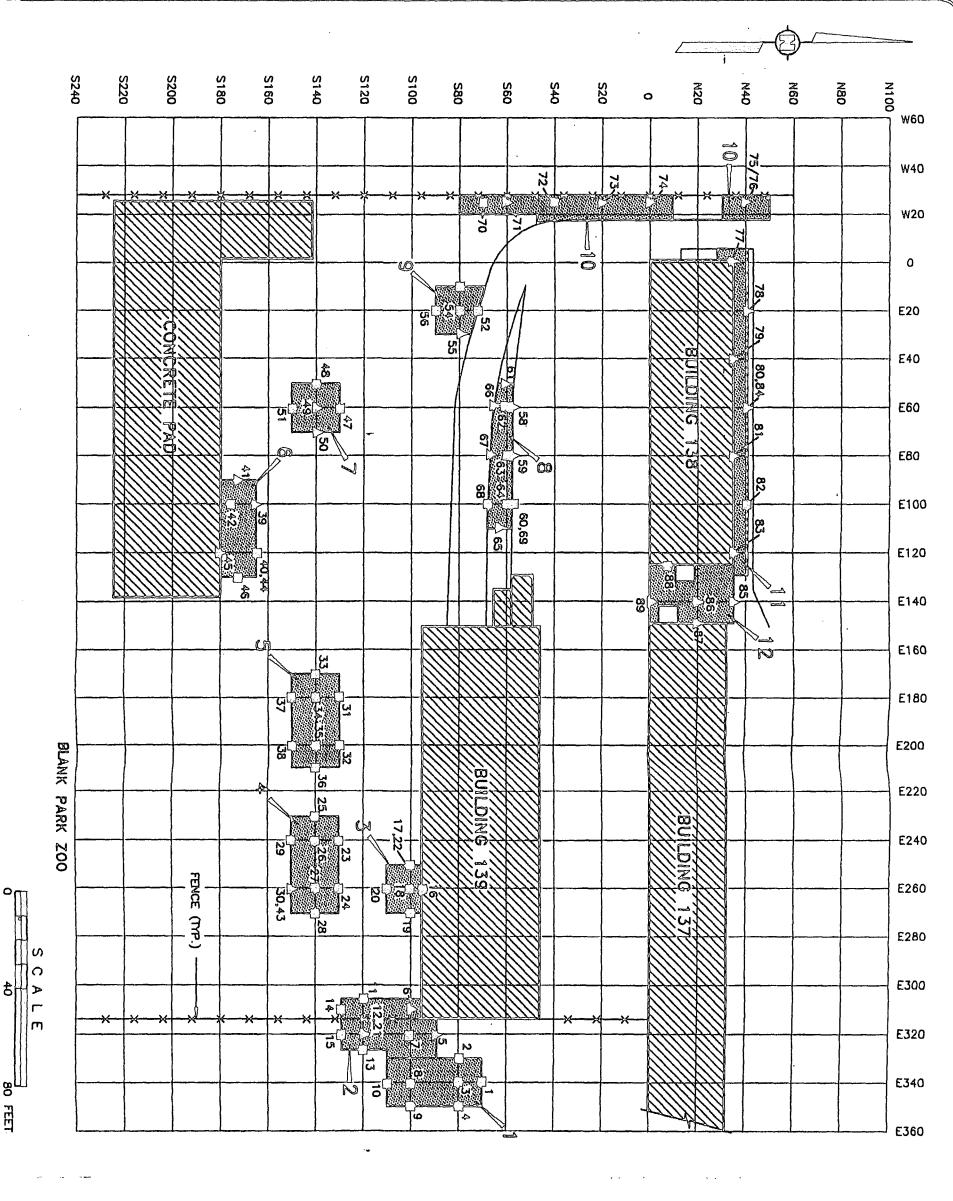
LEGEND:

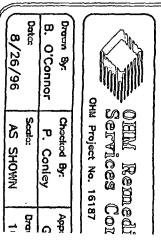
Drawing

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Approva

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3-6

U.S.	Same	₹0,	Δ			
FREDARD FOR ARMY CORPS OF ENG OMAHA, NEBRASKA	FIGURE 3.4 SAMPLE LOCATIONS — 8 INCH FORT DES MOINES DES MOINES, IOWA	Revision/Issue	INS DANIER CUS CERRULY FREPARE AS 16167-AB ENLARGED SCALE ACCE SACTE COUNTRICATION			

General Notes and Legenc LEGEND:

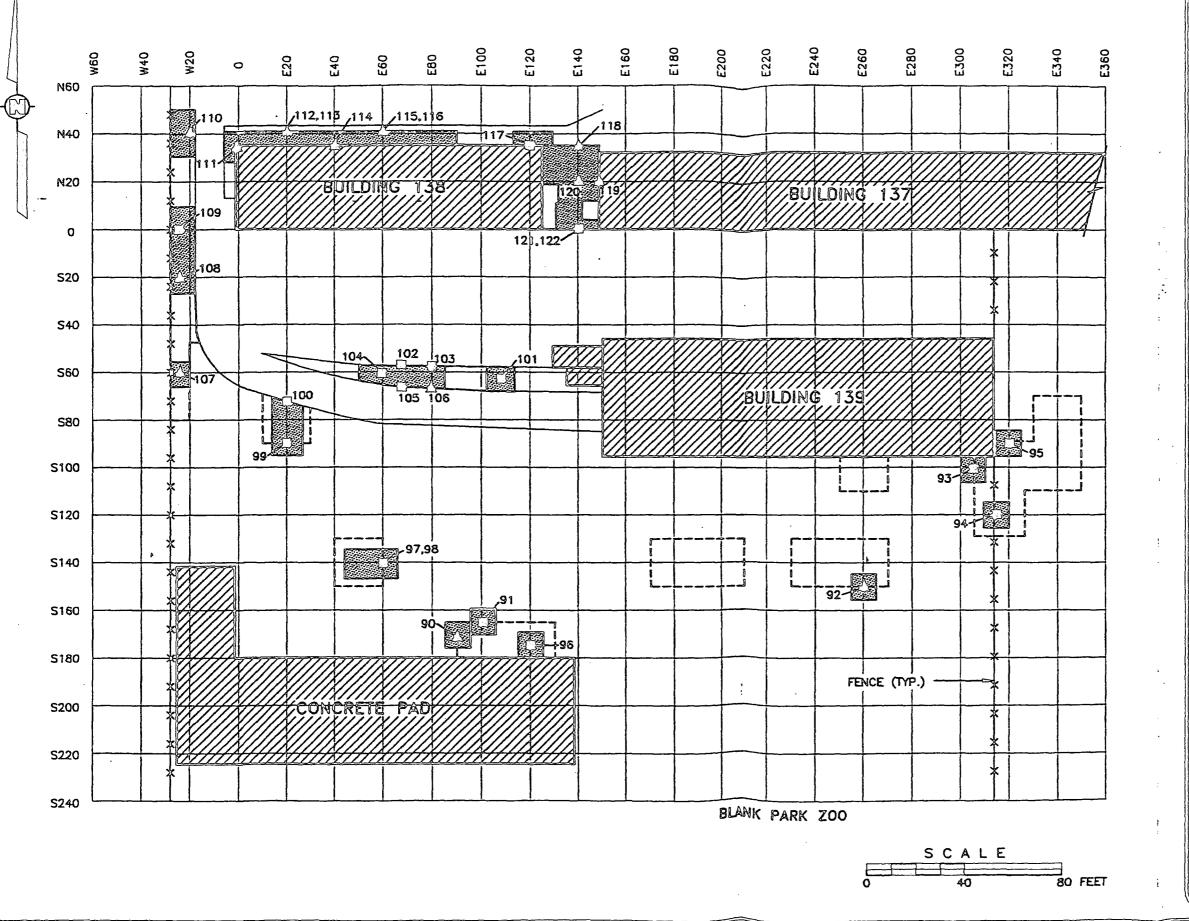
CONTRACTION SOIL SALTE LOCATION UNDER ACTION LEVELS BY BOTH ON-AMD OFF-SITE AWALYSIS

CONTRACTION SOIL SALTE LOCATION OFF-SITE AWALYSIS

OFF-SITE AWALYSIS

1. ALL SAMPLE POINTS PRETTY = CFS

POST EXCAVATION AREA



PREVIOUSLY CLEANED HOT SPOT AREA

101 CONFIRMATION SOIL SAMPLE LOCATION UNDER ACTION LEVELS BY BOTH ON-

103 CONFIRMATION SOIL SAMPLE LOCATION IS ABOVE ACTION LEVEL CONFIRMED BOFF-SITE ANALYSIS

NOTE:

1. ALL SAMPLE POINTS PREFTX = CFS

1. ~~								
	SAMPLE LOCATIONS REMAINING ABOVE ACTION LEVELS							
	LOCATION	AWALYTE	mg∕kg					
	CFS-090	DDE DIELDRIN	2.09 0.055					
	CFS-092	DOT 300	2.27 3.70					
	CFS-106	DDE DDT	7.14 3.87					
	CFS-107	DIELORIN	0.051					
	CFS-108	ALPHA—BHC BETA—BHC DDE DIELDRIN	5.92 17.1 32.0 25.9					
	CFS-110	001	1.98					
	CFS-111	ALPHA-BHC BETA-BHC DDE DIELDRIN	2.46 12.9 2.42 0.736					
	CFS-112	BETA-BHC OOT	3.35 6.10					
	CFS-113	BETA-BHC DIELDRIN	4.11 9.41					
	CF5-114	BETA-EHC DOT	0.485 0.078					
	CFS-115	BETA-BHC	0.433					
	CFS-118	ODE ODT DIELDRIN	3.99 8.26 0.302					
	CFŞ-120	00T	3.58					

A THIS DRADGING WAS ORIGINALLY PREPARED AS 16187—AS. ENLARGED SCALE ADDED SAMPLE IDENTIFICATION.

No. Revision/Issue

FIGURE 3.5
FINAL EXCAVATION RESUL
FORT DES MOINES
DES MOINES, IOWA

PREPARED FOR

U.S. ARMY CORPS OF ENGIR OMAHA, NEBRASKA



E OHM Remedia Services Corp

OHM Project No. 16187

Drawn By:	Checked By:	Approv
M. Warnick	P. Conley	G.
Date:	Scale:	Drawin
8/26/96	AS SHOWN	161
		

3-7

APPENDIX B GROUNDWATER SAMPLING RESULTS

WELL/DATE		MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1
	Action									
	Level	{							}	
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
				VERSAR)			OI	IM	
VOCs										
Cis-1,2 Dichloroethene	70°	ND	NA	<5	<5	<5	ND	ND	ND	ND
1,1-Dichloroethene	7	NA	NA	NA	NA	NA	ND	ND	ND	ND
1,2-Dichloroethane	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-xylene	N/A	NA	NA	<1	<1	<1	NA	NA	NA	NA
Acetone	4,000 ^b	ND	ND	<8	<8	<8	ND	ND	ND	ND
Benzene	5 ⁸	ND	ND	<1	<1	< <u>l</u>	ND	ND	ND	ND
Carbon tetrachloride	5ª	ND	ND	<1	<1	<1	ND	ND	ND	ND
Methylene chloride	5 ^d	ND	ND	<1	<1	<1	ND	ND	ND	ND
Chlorobenzene	100 ^a	ND	ND	1.44	<1	<1	ND	ND	ND	ND
Chloroform	100 ^a	ND	ND _	<1	<1	<1	ND	ND	ND	ND
Dichlorobenzene (total)	75ª	NA	NA	14.67	12.5	5.5	ND	ND	1.05	2.00
Ethylbenzene	700 ^a	ND	ND	<1	<1	<1	ND	ND	ND	ND
Tetrachloroethene	.5ª -	ND	ND	15.082113	1.9	0.93	ND	ND	ND	ND
Toluene	1,000°	ND	ND	<1	<1	<1	ND	ND	ND	ND
Trichloroethene	5°	加加速	110代學	34154	2.1	1	ND	ND	ND	ND
Xylenes (total)	10,000 ^a	ND	ND	<2	<2	<2	ND	ND	ND	ND
Pesticides										
Aldrin	2°	.233	NA	0.197	0.368	0.44	0.226	0.3	0.26	0.25
Alpha-BHC	0.028	>0.24	NA	4.80	696 图	122	10:084	0.6	0.242	QIBD
Alpha-Chlordane	2 ^e	>0.24	NA	NA	NA	NA	0.825	1	0.86	1.2
Alpha-Endosulfan	2 ^b	<.00856	NA	<0.025	0.0249	0.0241	ND	ND	0.942	ND
Beta-BHC	0.097	> 243	NA	0.819	·5142 B	*C'X83	0199	0.0177	(8)2411	0.377 (41
Beta-Endosulfan	2 ⁶	<.012	NA	< 0.077	<.0077	<.0077	ND	ND	ND	ND
Chlordane	2 ^e	NA	NA	< 0.312	<.0312	<.0312	3.1	9	7.45	9.3
Delta-BHC	0.21	224 15	NA	3(3B.7£	1055	1215±113	Di382 3	4018-18.T	0.4884	0.97





WELL/DATE		MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1
	Action									
	Level							}		
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Dieldrin	2°	1600	NA	1.15	1.26 E				型加速步	强进了
Endrin	2ª	.0826	NA	0.204	0.155	0.174	0.186	0.2	0.158	0.11
Endrin Ketone	NA	<.0282	NA	ND	0.0681	0.0948	0.079	0.06	0.2	0.051
Endosulfan Sulfate	N/A	<.02	NA	ND	0.0254	0.036	ND	ND	ND	0.033
Gamma Chlordane	2ª	>.24	NA	NA	NA	NA	0.738	1	ND	1.1
Heptachlor	0.4ª	<.0631	NA	.107	0.0587	0.0403	ND	0.04	ND	ND
Heptachlor epoxide	0.2ª	<.006	NA	<.063	0.0278	0.0244	ND	ND	ND	ND
Isodrin	N/A	NA	NA	0.0964	0.0318	0.0374	ND	ND	ND	ND
Lindane	0.2ª	> 10 P	NA	型的主	THE REAL PROPERTY.	001165	0.04	0.06	0.083	0.075
Methoxychlor	40 ^a	<.267	NA	<0.75	< 0.075	0.128	ND	ND	ND	ND
DDD	0.729	.627	NA		0.45		ND	0.97	0.548	0.47
DDE	0.514	<.0946	NA	0.189	0.105	0.0991	0.152	ND	ND	ND
DDT	0.35	.122	NA	<0.025	0.267	0.24	0.167	ND	ND	0.18
Herbicides										
2,4,5-T	100ª	NA	NA	0.306	NA	<0.16	ND	ND	ND	ND
2,4,5-TP	50°	NA	NA	<0.095	NA	<0.095	ND	ND	ND	ND
2,4-D	70°	NA	NA	1.35	NA	<0.263	ND	ND	1.21	0.20

Notes: NA = Not Analyzed ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa

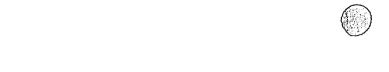






WELL/DATE		MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
AA 11.11.11.11.11.11.11.11.11.11.11.11.11.	Action	14111 2	141 44 5	11117	171 17 2	274 77 - 2	14111 2	141 11 7	AVE 11 2	141 44 -7
	Level						1			
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
CONSTITUENT	(ug) L)	14101 71		VERSAR	<u> </u>	1 60 73	June 70	OH	L	June 27
VOCs				A TOTAL STATE	<u> </u>				птап	l
Cis-1,2 Dichloroethene	70ª	ND			<5	<5	ND	ND	ND	ND
1,1-Dichloroethene	7	NA			NA	NA	ND	ND	ND	ND
1,2-Dichloroethane	5	NA			NA	NA	NA	NA	NA	NA
m-xylene	N/A	NA			<1	<1	NA	NA	NA	NA
Acetone	4,000 ^b	ND			<8	<8	ND	ND	ND	ND
Benzene	5ª	ND			<1	<1	ND	ND	ND	ND
Carbon tetrachloride	5ª	ND			<1	<1	ND	ND	ND	ND
Methylene chloride	5 ^d	ND			<1	<1	ND	2	ND	ND
Chlorobenzene	100ª	ND			< <u>l</u>	<1	ND	ND ND	ND	ND
Chloroform	100°	ND			<1	<1	ND	ND	ND	ND
Dichlorobenzene (total)	75°	NA			<2	<2	ND	ND	ND	ND
Ethylbenzene	700 ^a	ND			<1	<1	ND	ND	ND	ND
Tetrachloroethene	5 ⁸	ND			18:19:13			1102	2.77	18記録
Toluene	1,000 ^a	ND			<1	<1	ND	6	ND	ND
Trichloroethene	5°	ND			1.7	<1	ND	ND	ND	1
Xylenes (total)	10,000 ^a	ND			<2	<2	ND	ND	ND	ND
21 yiones (total)	10,000	112			-2		1,12	1112	1.2	110
Pesticides			,							
Aldrin	2°	<.0638			NA	.0383	ND	ND	ND	ND
Alpha-BHC	0.028	< 0434			NA	01188	ND	ND	ND	ND
Alpha-Chlordane	2ª	<.0202			NA	NA	ND	ND	ND	0.050
Alpha-Endosulfan	2 ^b	<.0086			NA	<.0025	ND	ND	ND	ND
Beta-BHC	0.097	3H4 (4)			NA	NA	0.607		0.965	0.240
Beta-Endosulfan	2 ^b	<.012			NA	NA	ND	ND	ND	ND
Chlordane	2ª	NA			NA	NA	0.122	ND	ND	ND
Delta-BHC	0.21	.419.			NA	NA	0.682			





WELL/DATE		MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
	Action									
	Level									
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Dieldrin	2°	<.0321			NA	NA	0.223	ND	0.312	0.410
Endrin	2ª	<.0372			NA	NA	ND	ND	ND	ND
Endrin Ketone	NA	<.0282			NA	NA	0.028	0.06	ND	ND
Endosulfan Sulfate	N/A	<.02			NA	NA ·	ND	ND	ND	ND
Gamma Chlordane	2 ⁸	<.045			NA	NA	ND	ND	ND	ND
Heptachlor	0.4ª	<.0631			NA	NA	ND	ND	ND	ND
Heptachlor epoxide	0.2ª	<.006			NA	NA	ND	ND	ND	ND
Isodrin	N/A	NA			NA	NA	ND	ND	ND	ND
Lindane	0.2ª	\$0.b			NA	NA		ND	ND	0.360
Methoxyclor	40ª	<.267			NA	NA	ND	ND	ND	ND
DDD	0.729	<.0848			NA	NA	ND	ND	ND	ND
DDE	0.514	<.0946			NA	NA	0.094	ND	ND	ND
DDT	0.35	<.0316			NA	NA	ND	ND	ND	ND
Herbicides										
2,4,5-T	100ª	NA			NA .	NA	ND	ND	ND	ND
2,4,5-TP	50°	NA	-		NA	NA	ND	ND	ND .	ND
2,4-D	70ª	NA			NA	NA	ND	ND	ND	ND

Notes: NA = Not Analyzed

ND = Not Detected

a = MCL

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WELL/DATE		MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3
	Action								٠	
	Level									
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
				VERSAR	<u> </u>	T		OF		
VOCs							ND	ND	ND	ND
Cis-1,2 Dichloroethene	70 ^a	ND					ND	ND	ND	ND
1,1-Dichloroethene	7	NA					ND	ND	ND	ND
1,2-Dichloroethane	5	NA					NA	NA	NA	NA _
m-xylene	N/A	NA			L		NA	NA	NA	NA
Acetone	4,000 ^b	ND					ND	ND	ND	ND
Benzene	5ª	ND			<u> </u>		ND	ND	ND	ND
Carbon tetrachloride	5ª	ND					ND	ND	ND	ND
Methylene chloride	5 ^d	ND					ND	ND	ND	ND
Chlorobenzene	100ª	ND					ND	ND	ND	ND
Chloroform	100 ^a	ND					ND	ND	ND	ND
Dichlorobenzene (total)	75°	NA					ND	ND	ND	ND
Ethylbenzene	700 ^a	ND					ND	ND	ND	ND _
Tetrachloroethene	5ª	ND					ND	ND	2.77	ND
Toluene	1,000°	ND					ND	ND	ND	ND
Trichloroethene	5ª	ND					ND	ND	ND	ND _
Xylenes (total)	10,000°	ND					ND	ND	ND	ND
Pesticides										
Aldrin	2°	<.0638					ND	ND	ND	ND
Alpha-BHC	0.028	<.0434					ND	ND	ND	ND
Alpha-Chlordane	2ª	<.0202			<u> </u>		ND	ND	ND	ND
Alpha-Endosulfan	2 ^b	<.0086]			ND	ND	ND	ND
Beta-BHC	0.097	NA					ND	ND	ND	ND
Beta-Endosulfan	26	NA					ND	ND	ND	ND
Chlordane	2ª	NA					ND	ND	ND	ND
Delta-BHC	0.21	NA					ND	ND	ND	ND







WELL/DATE		MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3
	Action									
	Level									
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Dieldrin	2°	NA					ND	ND	ND	ND
Endrin	2ª	NA					ND	ND	ND	ND
Endrin Ketone	NA	NA					ND	ND	ND	ND
Endosulfan Sulfate	N/A	NA					ND	ND	ND	ND
Gamma Chlordane	2ª	NA					ND	ND	ND	ND
Heptachlor	0.4 ^a	NA					ND	ND	ND	ND
Heptachlor epoxide	0.2ª	NA					ND	ND	ND	ND
Isodrin	N/A	NA					ND	ND	ND	ND
Lindane	0.2ª	NA					ND	ND	ND	ND
Methoxyclor	40 ^a	NA)	ND	ND	ND	ND
DDD	0.729	NA					ND	ND	ND	ND
DDE	0.514	NA					ND	ND	ND	ND
DDT	0.35	NA					ND	ND	ND	ND
Herbicides										
2,4,5-T	100ª	NA					ND	ND	ND	ND
2,4,5-TP	50ª	NA					ND	ND	ND	ND
2,4-D	70ª	NA					ND	0.500	ND	ND

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WELL/DATE		MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4
	Action									
	Level									
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
			lamo cara de la composição	VERSAR				OI		
VOCs										
Cis-1,2 Dichloroethene	70ª	ND			<5		ND	ND	ND	ND
1,1-Dichloroethene	7	NA			NA		ND	ND	ND	ND
1,2-Dichloroethane	5	NA					NA	·NA	NA	NA
m-xylene	N/A	NA			<1		NA	NA	NA	NA
Acetone	4,000 ^b	12			<8		ND	ND	ND	ND
Benzene	5ª	ND			<1		ND	ND	ND	ND
Carbon tetrachloride	5ª	ND		-	<1		ND	ND	ND	ND
Methylene chloride	5 ^a	ND			<1		ND	ND	ND	ND
Chlorobenzene	100 ^a	ND			<1		ND	ND	ND	ND
Chloroform	100 ^a	ND			<1		ND	ND	ND	ND
Dichlorobenzene (total)	75 ^a	NA			<2		ND	ND	ND	ND
Ethylbenzene	700 ^a	ND			<1		ND	ND	ND	ND
Tetrachloroethene	5ª	ND			<1		ND	ND	ND	ND
Toluene	1,000ª	ND			<1		ND	3	ND	ND
Trichloroethene	5ª	ND			<1		ND	ND	ND	ND
Xylenes (total)	10,000ª	ND			<2		ND	ND	ND	ND
Pesticides										
Aldrin	2°	<.0638			NA		ND	ND	ND	ND
Alpha-BHC	0.028	<.0434			NA		ND	ND	ND	ND
Alpha-Chlordane	2 ⁸	<.0202			NA		ND	ND	ND	ND
Alpha-Endosulfan	2 ^b	<.0086			NA		ND	ND	ND	ND
Beta-BHC	0.097	NA			NA		ND	ND	ND	ND
Beta-Endosulfan	2 ^b	NA			NA		ND	ND	ND	ND
Chlordane	2 ^a	NA			NA		ND	ND	ND	ND







WELL/DATE		MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4
	Action									
	Level									
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Delta-BHC	0.21	NA			NA		ND	ND	ND	ND
Dieldrin	2°	NA			NA		0.012	ND	ND	ND
Endrin	2ª	NA			NA		ND	ND	ND	ND
Endrin Ketone	NA	NA			NA		ND	ND	ND	ND
Endosulfan Sulfate	N/A	NA			NA		ND	ND	ND	ND
Gamma Chlordane	2ª	NA			NA		ND	ND	ND	ND
Heptachlor	0.4ª	NA			NA		ND	ND	ND	ND
Heptachlor epoxide	0.2ª	NA			NA		ND	ND	ND	ND
Isodrin .	N/A	NA			NA		ND	ND	ND	ND
Lindane	0.2^a	NA			NA		ND	ND	ND	ND
Methoxyclor	40 ⁸	NA			NA		ND	ND	ND	ND
DDD	0.729	NA			NA		ND	ND	ND	ND
DDE	0.514	NA			NA		ND	ND	ND	ND
DDT	0.35	NA			NA		ND	ND	ND	ND
Herbicides										
2,4,5-T	100 ^a	NA			NA		ND	ND	ND	ND
2,4,5-TP	50°	NA			NA		ND	ND	ND	ND
2,4-D	70°	NA			NA		ND	ND	ND	0.2

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WELL/DATE		MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5
	Action									
	Level					1				
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
		J		VERSAR					IM	· .
VOCs										
Cis-1,2 Dichloroethene	70°	NA					ND	ND	ND	ND
1,1-Dichloroethene	7	NA					ND	ND	ND	ND
1,2-Dichloroethane	5	NA					NA	NA	NA	NA
m-xylene	N/A	NA					NA	NA	NA	NA
Acetone	4,000 ^b	NA					ND	ND	ND	ND
Benzene	5ª	NA					ND	ND	ND	ND
Carbon tetrachloride	5ª	NA					ND	ND	ND	ND
Methylene chloride	5 ^d	NA					ND	ND	ND	ND
Chlorobenzene	100ª	NA					ND	ND	ND	ND
Chloroform	100°	NA					ND	ND	ND	ND
Dichlorobenzene	75°	NA					ND	ND	ND	ND
Ethylbenzene	700°	NA				·	ND	ND	ND	ND
Tetrachloroethene	5ª	NA					ND	ND	ND	ND
Toluene	1,000°	NA					ND	ND	ND	ND
Trichloroethene	5ª	NA'					ND	ND	ND	ND
Xylenes (total)	10,000°	NA					ND	ND	ND	ND
						[]		
Pesticides										
Aldrin	2°	<.0638					ND	ND	ND	ND
Alpha-BHC	0.028	<.0424					ND	ND	ND	ND
Alpha-Chlordane	2 ^e	<.0202	•				ND	ND	ND	ND
Alpha-Endosulfan	2 ^b	<.0086					ND	ND	ND	ND
Beta-BHC	0.097	<.0109					ND	ND	ND	ND
Beta-Endosulfan	2 ^b	<.012					ND	ND	ND	ND
Chlordane	2ª	NA					ND	ND	ND	ND







WELL/DATE		MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5	MW-5
	Action									
	Level]				
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Delta-BHC	0.21	<.0488					ND	ND	ND	ND
Dieldrin	2°	<.0321					ND	ND	ND	ND
Endrin	2ª	<.0372					ND	ND	ND	ND
Endrin Ketone	NA	<.0282					ND	ND	ND	ND
Endosulfan Sulfate	N/A	<.02					ND	ND	ND	ND
Gamma Chlordane	2ª	<.045					ND	ND	ND	ND
Heptachlor	0.4ª	<.0631					ND	ND	ND	ND
Heptachlor epoxide	0.2ª	<.006					ND	ND	ND	ND
Isodrin	N/A	NA					ND	ND	ND	ND
Lindane	0.2 ⁸	<.0429					ND	ND	ND	ND
Methoxyclor	40ª	<.267					ND	ND	ND	ND
DDD	0.729	<.0848					ND	ND	ND	ND
DDE	0.514	<.0946					ND	ND	ND	ND
DDT	0.35	.0407					ND	ND	ND	ND
Herbicides										
2,4,5-T	100ª	NA					ND	ND	ND	ND
2,4,5-TP	50 ^e	NA					ND	ND	ND	ND
2,4-D	70ª	NA					ND	ND	ND	ND

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							11009 110 00			
WELL/DATE		MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6
	Action							1]
	Level								1	
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
				VERSAR				OF	IM	
VOCs										
Cis-1,2 Dichloroethene	70°	ND					ND	ND	ND	ND
1,1-Dichloroethene	7	NA					ND	ND	ND	ND
1,2-Dichloroethane	5	NA					NA	NA	NA	NA
m-xylene	N/A	NA					NA	NA	NA	NA
Acetone	4,000 ^b	ND					ND	ND	ND	ND
Benzene	5 ^a	ND					ND	ND	ND	ND
Carbon tetrachloride	5 ^a	ND					ND	ND	ND	ND
Methylene chloride	5 ^d	ND					ND	2	ND	ND
Chlorobenzene	100 ^a	ND					ND	ND	ND	ND
Chloroform	100ª	ND					ND	ND	ND	ND
Dichlorobenzene (total)	75 ⁸	NA					ND .	ND	ND	ND
Ethylbenzene	700°	ND					ND	ND	ND	ND
Tetrachloroethene	5ª	ND					ND	ND	ND	ND
Toluene	1,000 ⁸	ND					ND	3	ND	ND
Trichloroethene	5 ^a	ND					ND	ND	ND	ND
Xylenes (total)	10,000ª	ND					ND	ND	ND	ND
Pesticides										
Aldrin	2°	<.0638					ND	ND	ND	ND
Alpha-BHC	0.028	<1045 R					ND	ND	ND	ND
Alpha-Chlordane	2ª	<.0202					ND	ND	ND	ND
Alpha-Endosulfan	2 ^b	<.0086			<u> </u>		ND	ND	ND	ND
Beta-BHC	0.097	<.0109					ND	ND	ND	ND
Beta-Endosulfan	2 ^b	<.012					ND	ND	ND	ND
Chlordane	2ª	NA					ND	ND	ND	ND
1		u '^^	1	L	1	l	L-12			







WELL/DATE		MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6
	Action									
	Level]		
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97_	June 97
Delta-BHC	0.21	<.0488					ND	ND	ND	ND
Dieldrin	2°	<.0321				1	ND	ND	ND	ND
Endrin	2ª	<.0372					ND	ND	ND	ND
Endrin Ketone	NA	<.0282					ND	ND	ND	ND
Endosulfan Sulfate	N/A	<.02					ND	ND	ND	ND
Gamma Chlordane	2ª	<.045					ND	ND	ND	ND
Heptachlor	0.4ª	<.0631					ND	ND	ND	ND
Heptachlor epoxide	0.2ª	<.006					ND	ND	ND	ND
Isodrin	N/A	NA					ND	ND	ND	ND
Lindane	0.2ª	<.0429					ND	ND	ND	ND
Methoxyclor	40 ^a	<.267					ND	ND	ND	ND
DDD	0.729	<.0848					ND	ND	ND	ND
DDE	0.514	<.0946					ND	ND	ND	ND
DDT	0.35	<.0316					ND	ND	ND	ND
Herbicides										
2,4,5-T	100 ⁸	NA					ND	ND	ND	ND
2,4,5-TP	50 ^a	NA					ND	ND	ND	ND
2,4-D	70 ^a	NA					ND	ND	ND	ND

Notes: NA = Not Analyzed ND = Not Detected

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	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7
Action									
1									
(ug/L)	Mar 91				Feb 93	June 96		L	June 97
		·	VERSAR		<u></u>		OI	IMI .	
70 ^a									ND
7			NA		NA	ND	ND	ND	ND
5			NA		NA	NA	NA	NA	NA
N/A			<1		<1	NA	NA	NA	NA
4,000 ^b			<8		<8	ND	ND	ND	ND
5ª			<1		<1	ND	ND	ND	ND
5ª			<1		<1	ND	ND	ND	ND
5 ^d			<1		<1	1.21	ND	ND	ND
100ª			<1		<1	ND	ND	ND	ND
100ª			<1		1.2	ND	ND	2.66	1
75 ^a			<2		<2	ND	ND	ND	ND
700 ^a			<1		<1	ND	ND	ND	ND
5 ^e			<1		<1	ND	ND	ND	ND
1,000°			<1		<1	ND	ND	2.62	ND
5°			<1		<1	ND	ND	ND	ND
10,000°			<2		<2	ND	ND	1.85	ND
		<u> </u>				<u></u>	<u> </u>		
2°			<.0074		<.0074	ND	ND	ND	ND
0.028			<.0025	-	<.0025	ND	ND	ND	ND
2ª			NA		NA	ND	ND	ND	ND
2 ^b			<.0025		<.0025	ND	ND	ND	ND
0.097			<.0099		<.0099	ND	ND	ND	ND
2 ^b			<.0077		<.0077	ND	ND	ND	ND
2 ^a			<.0312		<.0312	ND	ND	ND	ND
	Level (ug/L) 70° 7 5 N/A 4,000° 5° 5° 100° 75° 700° 5° 1,000° 5° 1,000° 2° 0.028 2° 0.097 2°	Action Level (ug/L) Mar 91 70° 7 5 N/A 4,000° 5° 5° 5° 100° 100° 75° 700° 5° 11,000° 5° 10,000° 75° 10,000° 75° 70,000° 75° 70,000° 75° 70,000° 70,	Action Level (ug/L) 70a 70 7 5 N/A 4,000b 5a 5a 5a 100a 100a 75a 700a 75a 700a 75a 700a 75a 700a 75a 700a 75a 1,000a 5a 10,000a 5a 10,000a	Action Level (ug/L) Mar 91 Jul 91 Dec 91 VERSAR 70a 70a 70a 70a 70a 70a 70a 70	Action Level (ug/L) Mar 91 Jul 91 Dec 91 Oct 92	Action Level (ug/L) Mar 91 Jul 91 Dec 91 Oct 92 Feb 93	Action Level (ug/L) Mar 91 Jul 91 Dec 91 Oct 92 Feb 93 June 96	Action Level (ug/L) Mar 91 Jul 91 Dec 91 Oct 92 Feb 93 June 96 Sep 96	Action Level (ug/L) Mar 91 Jul 91 Dec 91 Oct 92 Feb 93 June 96 Sep 96 Jan 97 70°





WELL/DATE		MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7
	Action									
	Level))			1		ļ			
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Delta-BHC	0.21			<.0034		<.0034	ND	ND	ND	ND
Dieldrin	2°			<.0074		.00995	ND	ND	ND	ND
Endrin	2 ^a			<.0176		<.0176	ND	ND	ND	ND
Endrin Ketone	NA			ND		ND	ND	ND	ND	ND
Endosulfan Sulfate	N/A			ND		ND	ND	ND	ND	ND
Gamma Chlordane	2ª			NA		NA	ND	ND	ND	ND
Heptachlor	0.4ª			<.0025		<.0025	ND	ND	ND	ND
Heptachlor epoxide	0.2ª			<.0063		<.0063	ND	ND	ND	ND
Isodrin	N/A			<.0025		<.0025	ND	ND	ND	ND
Lindane	0.2ª			<.0025		<.0025	ND	ND	ND	ND
Methoxyclor	40 ^a			<.075		<.075	ND	ND	ND	ND
DDD	0.729			<.0081		<.0081	ND	ND	ND	ND
DDE	0.514			<.0039		.00411	ND	ND	ND	ND
DDT	0.35			<.0025		<.0025	ND	ND	ND	ND
Herbicides										
2,4,5-T	100 ^a			<.16		<.16	ND	ND	ND	ND
2,4,5-TP	50 ^a			<.095		<.095	ND	ND	ND	ND
2,4-D	70ª			<.263		<.263	ND	ND	ND	ND

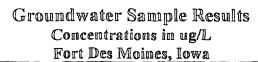
Notes: NA = Not Analyzed ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) – Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa



WELL/DATE		MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8
	Action									
	Level									[
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96		June 97
				VERSAR				OF	IM	
VOCs										
Cis-1,2 Dichloroethene	70ª			<5	<5		ND	ND	ND	ND
1,1-Dichloroethene	7			NA	NA		ND	ND	ND	ND
1,2-Dichloroethane	5			NA	NA		NA	NA	NA	NA
m-xylene	N/A			<1	<1		NA	NA	NA	NA
Acetone	4,000 ^b			<8	<8		ND	ND	ND	ND
Benzene	5 ^a	1		<1	<1		ND	ND	ND	ND
Carbon tetrachloride	5ª			<1	<1		ND	ND	ND	ND
Methylene chloride	5 ^d			<1	<1		ND	ND	ND	ND
Chlorobenzene	100°			<1	<1		ND	ND	ND	ND
Chloroform	100°			<1	<1		ND	ND	ND	ND
Dichlorobenzene (total)	75ª			<2	<2		ND	ND	ND	ND
Ethylbenzene	700 ^a			<1	<1		ND	ND	ND	ND
Tetrachloroethene	5ª			<1	<1		ND	ND	ND	ND
Toluene	1,000°			<1	<1		ND	ND	ND	ND
Trichloroethene	5ª			<1	<1		ND	ND	ND	ND
Xylenes (total)	10,000ª			<2	<2		ND	ND	ND	ND
Pesticides			Ĺ							
Aldrin	2°			<.0074	<.0074		ND	ND	ND	ND
Alpha-BHC	0.028			<.0025	<.0025		ND	ND	ND	ND
Alpha-Chlordane	2ª			NA	NA		ND	ND	ND	ND
Alpha-Endosulfan	2 ⁶			<.0025	<.0025		ND	ND	ND	ND
Beta-BHC	0.097			<.0099	<.0099		ND	ND	ND	ND
Beta-Endosulfan	2 ⁶			<.0077	<.0077		ND	ND	ND	ND



WELL/DATE		MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8
	Action									
	Level					}				
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Chlordane	2ª			<.0312	<.0312		ND	ND	ND	ND
Delta-BHC	0.21			.00492	<.0034		ND	ND	ND	ND
Dieldrin	2°			<.0074	<.0074		ND	ND	ND	ND
Endrin	2ª			<.0176	<.0176		ND	ND	ND	ND
Endrin Ketone	NA			ND	ND		ND	ND	ND	ND
Endosulfan Sulfate	N/A			ND	ND		ND	ND	ND	ND
Gamma Chlordane	2ª			NA	NA		ND	ND	ND	ND
Heptachlor	0.4 ^a			<.0025	<.0025		ND	ND	ND	ND
Heptachlor epoxide	0.2ª			<.0063	<.0063		ND	ND	ND	ND
Isodrin	N/A			<.0025	.00354		ND	ND	ND	ND
Lindane	0.2ª			<.0025	<.0025		ND	ND	ND	ND
Methoxyclor	40 ^a			<.075	<.075		ND	ND	ND	ND
DDD	0.729			<.0081	<.0081		ND	ND	ND	ND
DDE	0.514			<.0039	<.0039		ND	ND	ND	ND
DDT	0.35			<.0025	<.0025		ND	ND	ND	ND
Herbicides										
2,4,5-T	100 ^a			<.16	NA		ND	ND	ND	ND
2,4,5-TP	50°			<.095	NA		ND	ND	ND	ND
2,4-D	70ª			<.263	NA		ND	ND	ND	ND

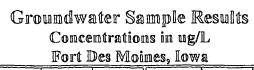
Notes: NA = Not Analyzed ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

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d = NRL - Negligible Risk Level for Carcinogens, State of Iowa



WELL/DATE]	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9
	Action									
	Level					į]	
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
				VERSAR		,		OH	IM	
VOCs								ļ. <u>.</u>		
Cis-1,2 Dichloroethene	70°						ND	ND	ND	ND
1,1-Dichloroethene	7						ND	ND	ND	ND
1,2-Dichloroethane	5						NA	NA	NA	NA
m-xylene	N/A						NA	NA	NA	NA
Acetone	4,000 ^b						NA	NA	NA	ND
Benzene	5ª						ND	ND	ND	ND
Carbon tetrachloride	5°						ND	ND	ND	ND
Methylene chloride	5 ^d						ND	ND	ND	ND
Chlorobenzene	100 ⁸						ND	ND	ND	ND
Chloroform	100ª						ND	ND	ND	ND
Dichlorobenzene (total)	75ª						ND	ND	ND	ND
Ethylbenzene	700 ^B				· .		ND	ND	ND	ND
Tetrachloroethene	5 ^a						ND	ND	ND	ND
Toluene	1,000°						ND	ND	ND_	ND
Trichloroethene	5 ^a	}			}		ND	ND	ND	ND
Xylenes (total)	10,000 ^a						ND	ND	ND	ND
D. dieil							<u> </u>	·		ļ
Pesticides	00	ļ				ļ) TO	NTS	NTD	170
Aldrin	2°			ļ		 	ND	ND	ND	ND
Alpha-BHC	0.028	ļ		ļ			ND	ND	ND	ND
Alpha-Chlordane	2ª		ļ				ND .	ND	ND	ND
Alpha-Endosulfan	2 ^b						ND	ND	ND	ND
Beta-BHC	0.097						ND	ND	ND	ND
Beta-Endosulfan	2 ^b						ND	ND	ND	ND

WELL/DATE		MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9
	Action									
CONOMINATION	Level	,, ,,								_
CONSTITUENT	(ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Chlordane]					ND	ND	ND	ND
Delta-BHC	0.21						ND	ND	ND	ND
Dieldrin	2°						ND	ND	ND	ND
Endrin	2ª						ND	ND	ND	ND
Endrin Ketone	NA						ND	ND	ND	ND
Endosulfan Sulfate	N/A						ND	ND	ND	ND
Gamma Chlordane	2 ^a						ND	ND	ND	ND
Heptachlor	0.4ª						ND	ND	ND	ND
Heptachlor epoxide	0.2ª						ND	ND	ND	ND
Isodrin	N/A						ND	ND	ND	ND
Lindane	0.2ª						ND	ND	ND	ND
Methoxychlor	40ª						ND	ND	ND	ND
DDD	0.729						ND	ND	ND	ND
DDE	0.514						ND	ND	ND	ND
DDT	0.35						ND	ND	ND	ND
									i	
Herbicides										
2,4,5-T	100ª						ND	ND	ND	ND
2,4,5-TP	50°						ND	ND	ND	ND
2,4-D	70ª						ND	ND	ND	ND

Notes: NA = Not Analyzed

ND = Not Detected

a = MCL

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c = HAL – Lifetime Health Advisory Level for a Contaminant, State of Iowa
d = NRL – Negligible Risk Level for Carcinogens, State of Iowa
e = RCRA Corrective Action Levels, Appendices A-C of 40 CFR 264-521, July 27, 1990.







				TOUT TOES TATOURIES				
WELL/DATE					MW-10	MW-10	MW-10	MW-10
	Action)]			
	Level					,		
CONSTITUENT	(ug/L)				June 96	Sep 96	Jan 97	June 97
			VERSAR	\		OI	IMI	
VOCs								
Cis-1,2 Dichloroethene	70ª				NA	NA	NA	ND
1,1-Dichloroethene	7				ND	ND	ND	ND
1,2-Dichloroethane	5				NA	NA	NA	NA
m-xylene	N/A				NA	NA	NA	NA
Acetone	4,000 ^b				NA	NA	NA	ND
Benzene	5°				ND	ND	ND	ND
Carbon tetrachloride	5°				ND	ND	ND	ND
Methylene chloride	5 ^d				ND	ND	ND	ND
Chlorobenzene	100ª				ND	ND	ND	ND
Chloroform	100ª				ND	ND	ND	ND
Dichlorobenzene (total)	75ª				ND	ND	ND	ND
Ethylbenzene	700 ^a				ND	ND	ND	ND
Tetrachloroethene	5 ^a				ND		4.84	2
Toluene	1,000 ^a				ND	ND	1.2	ND
Trichloroethene	5ª				ND	ND	ND	ND
Xylenes (total)	10,000°				ND	ND	ND	ND
Pesticides					<u> </u>			
Aldrin	2 ^c		_	 	ND	ND	ND	ND
Alpha-BHC	0.028			 	0.042		0.102	0.030
Alpha-Chlordane	2 ⁸				0.035	0.02	ND	ND
Alpha-Chlordane Alpha-Endosulfan	2 ^b				ND	ND	ND	ND
Beta-BHC	0.097					IND	0.979	0.460
					0.445	10.8 時間	and the state of the	LORD BUT THOMAS ARE A
Beta-Endosulfan	2 ^ь				ND	ND	ND	ND







WELL/DATE			 1		 	MW-10	MW-10	MW-10	MW-10
	Action								
CANDICAMENT IN PLAN	Level	}				June 96	Son 06	Jan 97	June 97
CONSTITUENT Chlordane	(ug/L)	 	 	_		0.379	Sep 96 0.6	ND	0.220
Delta-BHC	0.21		 			0.834	2	2.87	1.000
Dieldrin	2°		 			0.285	0.6	0.831	0.260
			 			JL			
Endrin	2ª		<u> </u>			0.017	0.02	ND	ND
Endrin Ketone	NA				_	0.017	0.02	ND	ND
Endosulfan Sulfate	N/A					0.043	0.1	0.072	0.230
Gamma Chlordane	2ª					0.018	0.03	0.012	ND
Heptachlor	0.4ª				Ì	ND	ND	ND	ND
Heptachlor epoxide	0.2ª					0.013	ND	ND	ND
Isodrin	N/A			·		ND	NR	ND	ND
Lindane	0.2ª					ND	ND	ND	ND
Methoxychlor	40 ^a					ND	ND	ND	ND
DDD	0.729					0.035	ND	ND	ND
DDE	0.514					0.03	ND	ND	ND
DDT	0.35					0.023	ND	ND	ND
Herbicides									
2,4,5-T	100 ^a					ND	ND	ND	ND
2,4,5-TP	50°					ND	ND	ND	ND
2,4-D	70 ^a					ND	ND	ND	ND

Notes: NA = Not Analyzed

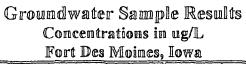
ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

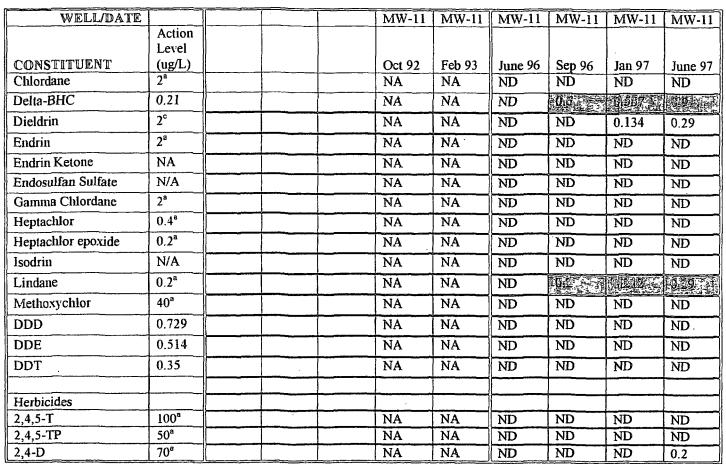
c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa



WELL/DATE			MW-11	MW-11	MW-11	MW-11	MW-11	MW-11
	Action	<u> </u>						
	Level							
CONSTITUENT	(ug/L)		Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
		VERSAR				OF	İM	
VOCs								
Cis-1,2 Dichloroethene	70 ^a		NA	NA	ND	ND	ND	ND
1,1-Dichloroethene	7		NA	NA	ND	ND	ND	ND
1,2-Dichloroethane	5		NA	NA	NA	NA	NA	NA
m-xylene	N/A		NA	NA	NA	NA	NA	NA
Acetone	4,000 ^b		NA	NA	NA	NA	NA	ND
Benzene	5ª		NA	NA	ND	ND	ND	ND
Carbon tetrachloride	5°		NA	NA	ND	ND	ND	ND
Methylene chloride	5 ^d		NA	NA	ND	ND	ND	ND
Chlorobenzene	100ª		NA	NA	ND	ND	ND	ND
Chloroform	100 ^a		NA	NA	ND	ND	ND	ND
Dichlorobenzene (total)	75°		NA	NA	ND	ND	ND	ND
Ethylbenzene	700°		NA	NA.	ND	ND	ND	ND
Tetrachloroethene	5ª		NA	NA	ND	3	1.75	15 Table 2
Toluene	1,000°		NA	NA	ND	ND	ND	ND
Trichloroethene	5 ^a		NA	NA	1.29	ND	ND	ND
Xylenes (total)	10,000 ^a		NA	NA	ND	ND	ND	ND
Pesticides								
Aldrin	2°		NA	NA	ND	ND	ND	ND
Alpha-BHC	0.028		NA	NA	ND	ND	ND	ND
Alpha-Chlordane	2 ^B		NA	NA	ND	0.06	ND	0.035
Alpha-Endosulfan	2 ^b		NA	NA	ND	ND	ND	ND
Beta-BHC	0.097		NA	NA	ND	0.69	0.562	0.89
Beta-Endosulfan	2 ^b		NA	NA	ND	ND	ND	ND

*		



Notes: NA = Not Analyzed ND = Not Detected

a = MCL

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c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa

e = RCRA Corrective Action Levels, Appendices A-C of 40 CFR 264-521, July 27, 1990.







			TOTAL PC3 IVIOLITICS		-بنديد		
WELL/DATE		MW-12		MW-12	MW-12	MW-12	MW-12
	Action					h	
	Level						
CONSTITUENT	(ug/L)	Dec 91		June 96	Sep 96	Jan 97	June 97
		VERSAR	<u> </u>		01	IM	
VOCs							
Cis-1,2 Dichloroethene	70 ^a	NA NA		ND	ND	ND	ND
1,1-Dichloroethene	7	NA NA		ND	ND	ND	ND
1,2-Dichloroethane	5	NA		NA	NA	NA	NA
m-xylene	N/A	NA		NA	NA	NA	NA
Acetone	4,000 ^b	NA		NA	NA	NA	ND
Benzene	5ª	NA		ND	ND ·	ND	ND
Carbon tetrachloride	5ª	NA		ND	ND	ND	ND
Methylene chloride	5 ^d	NA		ND	ND	ND	ND
Chlorobenzene	100ª	NA		ND	ND	ND	ND
Chloroform	100°	NA		ND	ND	ND	ND
Dichlorobenzene (total)	75°	NA		ND	ND	ND	ND
Ethylbenzene	700 ^a	NA NA		ND	ND	ND	ND
Tetrachloroethene	5ª	NA		ND	ND	ND	ND
Toluene	1,000°	NA NA		ND	ND	ND	ND
Trichloroethene	5 ⁸	NA		ND	ND	ND	ND
Xylenes (total)	10,000°	NA		ND	ND	ND	ND
Pesticides							
Aldrin	2°	NA		ND	ND	ND	ND
Alpha-BHC	0.028	NA		ND	ND	ND	ND
Alpha-Chlordane	2ª	NA		0.017	ND	ND	ND
Alpha-Endosulfan	2 ⁵	NA		ND	ND	ND	ND
Beta-BHC	0.097	NA		10207部	ND	ND	ND
Beta-Endosulfan	2 ^b	NA NA		ND	ND	ND	ND







WELL/DATE		MW-12	MW-12	N 5337 12	N 4337 12	A 617/ 10
A KRICITA AY I K	Action	MW-12	MW-12	MW-12	MW-12	MW-12
	Level					
CONSTITUENT	(ug/L)	Dec 91	June 96	Sep 96	Jan 97	June 97
Chlordane	2ª	NA NA	ND	NĎ	ND	ND
Delta-BHC	0.21	NA NA	ND	ND	ND	ND
Dieldrin	2 ^c	NA NA	0.109	ND	ND	ND
Endrin	2ª	NA NA	ND	ND	ND	ND
Endrin Ketone	NA	NA NA	ND	ND	ND	ND
Endosulfan Sulfate	N/A	NA NA	ND	ND	ND	ND
Gamma Chlordane	2ª	NA NA	0.014	ND	ND	ND
Heptachlor	0.4ª	NA NA	ND	ND	ND	ND
Heptachlor epoxide	0.2°	NA NA	ND	ND	ND	ND
Isodrin	N/A	NA NA	ND	ND	ND	ND
Lindane	0.2ª	NA NA	0.127	ND	ND	ND
Methoxychlor	40ª	NA NA	ND	ND	ND	ND
DDD	0.729	NA NA	ND	ND	ND	ND
DDE	0.514	NA NA	ND	ND	ND	ND
DDT	0.35	NA NA	ND	ND	ND	ND
Herbicides						
2,4,5-T	100 ^e	NA NA	ND	ND	ND	ND
2,4,5-TP	50°	NA NA	ND	ND	ND	ND
2,4-D	70°	NA NA	ND	ND	ND	ND

Notes: NA = Not Analyzed

ND = Not Detected

a = MCL

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			I OI C ID CO					
WELL/DATE		MW-1	3		MW-13	MW-13	MW-13	MW-13
	Action							
	Level					}		
CONSTITUENT	(ug/L)	Dec 91			June 96	Sep 96	Jan 97	June 97
		VERSAR			OHM			
VOCs								
Cis-1,2 Dichloroethene	70°	NA NA			ND	ND	ND	ND
1,1-Dichloroethene	7	NA NA			ND	ND	ND	ND
1,2-Dichloroethane	5	NA NA			NA	NA	NA	NA
m-xylene	N/A	NA NA			NA	NA	NA	NA
Acetone	4,000 ^b	NA NA			NA	NA	NA	ND
Benzene	5°	NA		-	ND	ND	ND	ND
Carbon tetrachloride	5ª	NA			ND	ND	ND	ND
Methylene chloride	5 ^d	NA			ND	2	ND	ND
Chlorobenzene	100°	NA			ND	ND	ND	ND
Chloroform	100°	NA			ND	ND	ND	ND
Dichlorobenzene (total)	75ª	NA			ND	ND	ND	ND
Ethylbenzene	700 ^e	NA			ND	ND	ND	ND
Tetrachloroethene	5 ^a	NA NA			ND	ND	ND	ND
Toluene	1,000°	NA NA			ND	4	ND	ND
Trichloroethene	5ª	NA NA			ND	ND	ND	ND
Xylenes (total)	10,000 ^a	NA			ND	ND	ND	ND
D-4:-:								
Pesticides	2°	NA NA			ND	ND	ND	ND
Aldrin								
Alpha-BHC	0.028	NA NA			ND	ND	ND	ND
Alpha-Chlordane	2ª	NA NA			ND	ND	ND	ND
Alpha-Endosulfan	2 ⁵	NA NA			ND	ND	ND	ND
Beta-BHC	0.097	NA			ND	ND	ND	ND
Beta-Endosulfan	2 ⁵	NA			ND	ND	ND	ND





WELL/DATE		MW-13	MW-13	MW-13	MW-13	MW-13
	Action Level					
CONSTITUENT	(ug/L)	Dec 91	June 96	Sep 96	Jan 97	June 97
Chlordane	2ª	NA	ND	ND	ND	ND
Delta-BHC	0.21	NA	ND	ND	ND	ND
Dieldrin	2°	NA NA	ND	ND	ND	ND
Endrin	2ª	NA NA	ND	ND	ND	ND
Endrin Ketone	NA	NA NA	ND	ND	ND	ND
Endosulfan Sulfate	N/A	NA NA	ND	ND	ND	ND
Gamma Chlordane	2ª	NA	ND	ND	ND	ND
Heptachlor	0.4ª	NA NA	ND	ND	ND	ND
Heptachlor epoxide	0.2ª	NA NA	ND	ND	ND	ND
Isodrin	N/A	NA NA	ND	ND	ND	ND
Lindane	0.2ª	NA NA	ND	ND	ND	ND
Methoxychlor	40ª	NA NA	ND	ND	ND	ND
DDD	0.729	NA NA	0.016	ND	ND	ND
DDE	0.514	NA NA	ND	ND	ND	ND
DDT	0.35	NA NA	ND	ND	ND	ND
Herbicides						
2,4,5-T	100 ⁸	NA NA	ND	ND	ND	ND
2,4,5-TP	50 ⁸	NA NA	ND	ND	ND	ND
2,4-D	70°	NA NA	ND	ND	ND	ND

ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) – Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

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	rori des laidines, hown											
WELL/DATE			MW-14	MW-14	MW-14	MW-14	MW-14	MW-14	MW-14			
	Action											
	Level						,		}			
CONSTITUENT	(ug/L)		Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97			
			VERSAR	}			OI	IM				
VOCs												
Cis-1,2 Dichloroethene	70 ^e		NA	NA	<5	ND	ND	ND	ND			
1,1-Dichloroethene	7		NA	NA	NA	ND	ND	ND	ND			
1,2-Dichloroethane	5		NA	NA	NA	NA	NA	NA	NA			
m-xylene	N/A		NA NA	NA	<1	NA	NA	NA	NA			
Acetone	$4,000^{6}$		NA	NA	<8	NA	NA	NA	ND			
Benzene	5ª		NA	NA	<1	ND	ND	ND	ND			
Carbon tetrachloride	5 ^a		NA	NA	<1	ND	ND	ND	ND			
Methylene chloride	5 ^d		NA	NA	<1	ND	ND	ND	ND			
Chlorobenzene	100 ^a		NA	NA	<1	ND	ND	ND	ND			
Chloroform	100 ^a		NA	NA	<1	ND	ND	ND	ND			
Dichlorobenzene (total)	75ª		NA	NA	<2	ND	ND	ND	ND			
Ethylbenzene	700°		NA	NA	<1	ND	ND	ND	ND			
Tetrachloroethene	5ª		NA NA	NA	<1	ND	ND	ND	ND			
Toluene	1,000°		NA	NA	<1	ND	ND	ND	ND			
Trichloroethene	5ª		NA	NA	<1	ND	ND	ND	ND			
Xylenes (total)	10,000°		NA	NA	<2	ND	ND	ND	ND			
							<u> </u>					
Pesticides				L								
Aldrin	2°		NA	NA	< 0.0074	ND	ND	ND	ND			
Alpha-BHC	0.028		NA	NA	<0.0025	ND	ND	ND	ND			
Alpha-Chlordane	2 ⁸		NA	NA	NA	ND	ND	ND	ND			
Alpha-Endosulfan	2 ⁶		NA	NA	<0.0025	ND	ND	ND	ND			
Beta-BHC	0.097		NA	NA	<0.0099	ND	ND	ND	ND			
Beta-Endosulfan	2 ^b		NA	NA	<0.0077	ND	ND	ND	ND			





WELL/DATE			MW-14	MW-14	MW-14	MW-14	MW-14	MW-14	MW-14
	Action Level								
CONSTITUENT	(ug/L)		Dec 91	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Chlordane	2ª		NA	NA	<0.0312	ND	ND	ND	ND
Delta-BHC	0.21		NA	NA	<0.0034	ND	ND	ND	ND
Dieldrin	2°		NA	NA	<0.0074	ND	ND	ND	ND
Endrin	2ª		NA	NA [·]	<0.0176	ND ·	ND	ND	ND
Endrin Ketone	NA		NA	NA	ND	ND	ND	ND	ND
Endosulfan Sulfate	N/A	:	NA	NA	ND	ND	ND	ND	ND
Gamma Chlordane	2ª		NA	NA	NA	ND	ND	ND	ND
Heptachlor	0.4ª		NA	NA	<0.0025	ND	ND	ND	ND
Heptachlor epoxide	0.2ª		NA	NA	<0.0063	ND	ND	ND	ND
Isodrin	N/A		NA	NA	<0.0025	ND	ND	ND	ND
Lindane	0.2ª		NA	NA	<0.0025	ND	ND	ND	ND
Methoxychlor	40 ^a		NA	NA	<0.075	ND	ND	ND	ND
DDD	0.729		NA	NA	<0.0081	ND	ND	ND	ND
DDE	0.514		NA	NA	<0.0039	ND	ND	ND	NĎ
DDT	0.35		NA	NA	<0.0025	ND	ND	ND	ND
Herbicides									
2,4,5-T	100ª		NA	NA	<0.16	ND	ND	ND	ND
2,4,5-TP	50 ^a		NA	NA	<0.095	ND	ND	ND	ND
2,4-D	70°		NA	NA	<0.263	ND	ND	ND	ND

ND = Not Detected

a = MCL

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Groundwater Sample Results Concentrations in ug/L

Fort	Des	Moines,	Iowa
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WELL/DATE				T	MW-14D	MW-14D	MW-14D	MW-14D	MW-14D	MW-14D
V E3E7E7 E3 E E E	Action				11111 142	WIN TID	WW	WW 14D	10100 140	IVI VV - I +D
	Level	1								
CONSTITUENT	(ug/L)			j	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
				VERSAR	· · · · · · · · · · · · · · · · · · ·			OI	HIMI	<u> </u>
VOCs										
Cis-1,2 Dichloroethene	70 ^a				<5	<5	ND	ND	ND	ND
1,1-Dichloroethene	7				NA	NA	ND	ND	ND	ND
1,2-Dichloroethane	5				NA	NA	NA	NA	NA	NA
m-xylene	N/A				<1	<1	NA	NA	NA	NA
Acetone	4,000 ^b				<8	<8	NA	NA	NA	ND
Benzene	5ª				<1	<1	ND	ND	ND	ND
Carbon tetrachloride	5ª				<1	<1	ND	ND	ND	ND
Methylene chloride	5 ^d				<1	<1	ND	ND	ND	ND
Chlorobenzene	100 ^a				<1	<1	ND	ND	ND	ND
Chloroform	100ª				<1	<1	ND	ND	ND	ND
Dichlorobenzene (total)	75°				<2	<2	ND	ND	ND	ND
Ethylbenzene	700°				<1	<1	ND	ND	ND	ND
Tetrachloroethene	5 ^a				<1	<1	ND	ND	ND	ND
Toluene	1,000*				<1	<1	ND	ND	ND	ND
Trichloroethene	5 ^a	j.			<1	<1	ND	ND	ND	ND
Xylenes (total)	10,000°				<2	<2	ND	ND	ND	ND
Pesticides		}							<u> </u>	
Aldrin	2°				<0.0074	<0.0074	ND	ND	ND	ND
Alpha-BHC	0.028			 	<0.0074	<0.0025	ND	ND	ND	ND
Alpha-Chlordane	2 ⁸			<u> </u>	NA	NA	ND	ND	ND	ND
Alpha-Endosulfan	2 ^b			 	<0.0025	<0.0025	ND	ND	ND	ND
Beta-BHC	0.097				<0.0099	<0.0099	ND	ND	ND	ND
Beta-Endosulfan	2 ^b			 	<0.0077	<0.0077	ND	ND	ND	ND
Chlordane	2ª				<0.0312	<0.0312	ND	ND	ND	ND
Delta-BHC	0.21				<0.0034	< 0.0034	ND	ND	ND	ND
Dieldrin	2°				< 0.0074	0.00945	ND	ND	ND	ND
Endrin	2ª				< 0.0176	< 0.0176	ND	ND	ND	ND
Endrin Ketone	NA				ND	ND	ND	ND .	ND	ND







WELL/DATE			MW-14D	MW-14D	MW-14D	MW-14D	MW-14D	MW-14D
	Action Level							
CONSTITUENT	(ug/L)		Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97
Endosulfan Sulfate	N/A		ND	ND	ND	ND	ND	ND
Gamma Chlordane	2ª		NA	NA	ND	ND	ND	ND
Heptachlor	0.4ª		<0.0025	<0.0025	ND	ND	ND	ND
Heptachlor epoxide	0.2ª		<0.0063	< 0.0063	ND	ND	ND	ND
Isodrin	N/A		<0.0025	<0.0025	ND	ND	ND	ND
Lindane	0.2ª		<0.0025	< 0.0025	ND	ND	ND	ND
Methoxychlor	40ª		<0.075	<0.075	ND	ND	ND	ND
DDD	0.729		<0.0081	<0.0081	ND	ND	ND	ND
DDE	0.514		<0.0039	<0.0039	ND	ND	ND	ND
DDT	0.35		<0.0025	<0.0025	ND	ND	ND	ND
Herbicides								
2,4,5-T	100 ^a		<0.16	<0.16	ND	ND	ND	ND
2,4,5-TP	50 ^a		<0.095	<0.095	ND	ND	ND	ND
2,4-D	70 ^a		<0.263	<0.263	ND	ND	ND	ND

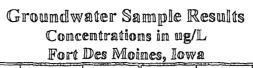
ND = Not Detected

a = MCL

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WELL/DATE				MW-17	MW-	MW-	MW-	MW-	MW-	MW-17	MW-17	MW-	MW-
	1 4 -41		 	ļ	17	17	1/	17	17			17	17
	Action Level							İ					
CONSTITUENT	· (ug/L)			Oct 92	Feb 93	June	Sep 96	Jan 97	June			June	
COMPTITORIAL	(ug/L)			. Oct 92	1.00 23	96	Scp 30	Jan J	97	Dec 99	Mar 00	00	Aug 00
			VERSAI			70		IMI	1_7/		CA		Augoo
VOCs							T	T T	<u> </u>			Ī	
Cis-1,2	70ª			100.5	30	ND	ND	ND	ND	ND	8.6	13	
Dichloroethene				調整理					1				
1,1-Dichloroethene	7			NA	NA	ND	ND	ND	ND	ND	0.22 J	0.44 J	
1,2-Dichloroethane	5			NA	NA	NA	NA	NA	NA	ND	ND	ND	
m-xylene	N/A			<10	4.2	NA	NA	NA	NA	ND	1.4*	2.1*	
Acetone	4,000 ^b			<80	<8	NA	NA	NA	ND	ND	ND	ND	3.4 J
Benzene	5ª			<10	2.1	ND	ND	11	ND	ND	3.4	5.8	
Carbon tetrachloride	5ª			<10	2.5	ND	ND	ND	ND	ND	ND	ND	
Methylene chloride	5 ^d			<10	8.6	1.7	33	21	ND	1.4 J	0.75 J	ND	
Chlorobenzene	100ª			<10	2.6	ND	ND	ND	ND	ND	6.9	9.5	
Chloroform	100ª			60	29	6.48	63	79.5	53	ND	ND	3.9	
Dichlorobenzene	75ª			<10	<2	ND	ND	ND	ND	ND	17.4	23.5 J	
(total)													
Ethylbenzene	700ª			<10	1.9	ND	ND	13.9	ND	ND	2.4	3.7	
Tetrachloroethene	5°			500日東南			300			ND	學的語言		
Toluene	1,000°		ļ	<10	1.4	ND	3	ND	ND	0.42 J	0.33 J	ND	
Trichloroethene	5 ⁸		ļ	200					34.345	ND		A52 1	
Xylenes (total)	10,000°		<u> </u>	80	19	ND	74	111	60	ND	6.5	7.4	
Pesticides									·				
Aldrin	2°			<0.007	< 0.07	ND	ND	ND	ND	ND	0.013 J	ND	0.011 J
Alpha-BHC	0.028			66 55 B	CANCELLAN	117.2	70	EDIO S	THE STATE OF	ND	10.24	20,91	
Alpha-Chlordane	2ª			NA	NA	ND	ND	ND	0.3	NA	NA	NA	
Alpha-Endosulfan	2 ^b			0.031	<0.003	ND	ND	ND	ND	ND	0.14	0.030 J	0.035 J
Beta-BHC	0.097	1		0厘差型	BUSIN	3172	Marin	12.08	22	ND	0.060	0.91	
Beta-Endosulfan	2 ^b			<0.008	<0.08	ND	ND	ND	ND	ND	0.0095 J	0.023 J	0.018 J
Chlordane	2ª			<0.031	<0.031	ND	ND	ND	ND	ND	ND	0.68 J	0.097 J
Delta-BHC	0.21			25	89.4	8.74	112 7 7	694	1500F	ND	0.16	021:	

)			



WELL/DATE		MW-17	MW-	MW-	MW-	MW-	MW-	MW-17	MW-17	MW-	MW-
			17	17	17	17	17			17	17
	Action Level										
CONSTITUENT	(ug/L)	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97	Dec 99	Mar 00	June 00	Aug 00
Dieldrin	2°	0.022	<0.074	0.263	ND	ND	ND		0.025 J	0.031 J	
Endrin	2ª	<0.018	<0.018	0.437	ND	ND	0.44	ND	ND	ND	
Endrin Ketone	NA	0.034	ND	0.351	ND	ND	ND	NA	NA	NA [·]	<u> </u>
Endosulfan Sulfate	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Gamma Chlordane	2ª	NA	NA	ND	ND	ND	ND	NA	NA	NA	
Heptachlor	0.4ª	< 0.003	<0.003	ND		ND	ND	ND	0.0065 J	ND	0.043 J
Heptachlor epoxide	0.2ª	*0399 E	<0.063	ND	ND	ND	ND	ND	ND	0.017 J	0.013 J
Isodrin	N/A	<0.003	< 0.003	ND	ND	ND	ND	NA	NA	NA	
Lindane	0.2ª							ND	20.41.67.74 3.42.55.6.2	047°	
Methoxychlor	40°	0.252	<0.75	ND	ND	ND	ND	ND	0.029 J	0.058 J	0.041
DDD	0.729	<0.008	<0.08	ND	ND	ND	ND	ND	ND	ND	
DDE	0.514	0.060	0.048	ND	ND	ND	ND	ND	0.010 J	ND	
DDT	0.35	<0.003	<0.003	ND	ND	ND	ND	ND	ND	0.015 J	
Herbicides					ļ						
2,4,5-T	100 ^a	NA	1.250	287	ND	97.7	1000	NA	NA	NA	
2,4,5-TP	50°	NA	0.337	ND	ND	ND	ND	NA	NA	NA	
2,4-D	70 ^a	NA	2.76	176-1	103co	知能"、"瓦	13000°	NA	NA	NA	

ND = Not Detected

a = MCL

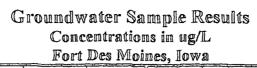
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e = RCRA Corrective Action Levels, Appendices A-C of 40 CFR 264-521, July 27, 1990.

*= m-xylene + p-xylene



WELL/DATE				MW-18	MW-18	MW- 18	MW-	MW- 18	MW- 18	MW-18	MW-18	MW- 18	MW- 18
	Action					10		10	10		 		10-
	Level												į
CONSTITUENT	(ug/L)	-		Oct 92	Feb 93	June	Sep 96	Jan 97	June	}		June	
COMMENCATION	1 (-6-)	İ		001 72	100 /5	96	Dep 50	3411	97	Dec 99	Mar 00	00	Aug 00
	 		VERSA	PR.	<u></u>			IMI	1	200 //	CA.		1 Mag 00
VOCs							T		T		I		<u> </u>
Cis-1,2	70°			6.7	7.7	ND	ND	ND	ND	ND	3.0	5.5	
Dichloroethene			Ì				}						
1,1-Dichloroethene	7			NA	NA	ND	ND	ND	ND	ND	ND	0.23 J	
1,2-Dichloroethane	5			NA	NA	NA	NA	NA	NA	ND	ND	ND	
m-xylene	N/A			<1	<1	NA	NA	NA	NA	ND	ND	ND	
Acetone	4,000 ^b			<8	<8	NA	NA	NA	ND	ND	ND	ND	ND
Benzene	5ª			< <u>l</u>	<1	ND	ND	ND	ND	ND	ND	ND	
Carbon tetrachloride	5ª			il Prizi	20	1.4	9	12.5	4	ND	80	7	
Methylene chloride	5 ^d			<1	<1	ND	ND	ND	ND	ND	0.48 J	ND	
Chlorobenzene	100ª			<1	<1	ND	ND	ND	ND	ND	ND	ND	1
Chloroform	100ª			36	26	ND	ND	ND	ND	ND	6.0	7.4	
Dichlorobenzene (total)	75ª			<2	<2	ND	ND	ND	ND	ND	ND	ND	
Ethylbenzene	700 ^a			<1	<1	ND	ND	ND	ND	ND	ND	ND	
Tetrachloroethene	5ª			174 88 17 B		ND .	ND	ND	ND	ND .		44.21% NB: 114	
Toluene	1,000°			<1	<1	ND	ND	ND	ND	ND	ND	ND	
Trichloroethene	5ª			5.3	3.1 生物	ND	ND	ND	ND	ND	1.3	2.6	
Xylenes (total)	10,000°			<2	<2	ND	ND	ND	ND	ND	ND	ND	
Pesticides	- 												
Aldrin				<0.0074	< 0.0074	ND	ND	ND	ND	ND	ND	ND	
Alpha-BHC	0.028			10.0074		ND	#0.050 Th	0.023	ND	ND	0.014 J	0.034 J	
Alpha-Chlordane	2ª			NA NA	NA	ND	0.020	ND	0.014	NA NA	NA	NA	
Alpha-Endosulfan	2 ^b			<0.0025	<0.0025	ND	ND	ND	ND	ND	ND	ND	
Beta-BHC	0.097			9,04,11		70.824	101800	0.532	10/180	ND	0.11	ND	0.02 J
Beta-Endosulfan	2 ^b			<0.0077	0.014	ND	ND	ND	ND	ND	ND	0.035	
Chlordane	2ª			<0.0312	< 0.0312	ND	ND	ND	ND	ND	ND	ND	
	1						J		J	L		<u></u>	







WELL/DATE		MW-18	MW-18	MW-	MW-	MW-	MW-	MW-18	MW-18	MW-	MW-
			·	18	18	18	18			18	18
	Action										
CONCERNMENT	Level	0.00					1	#	[_	
CONSTITUENT	(ug/L)	Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97	Dec 99	3.4 00	June 00	1
Delta-BHC	0.21		10/2852		Dan :	ENDORFE:	0.050	ND ND	Mar 00 0.025 J	0.10	Aug 00 0.014
Dieldrin	2°	0.0522	0.0381	0.048	0.080	0.038	ND	ND	0.0071 J	0.011 J	
Endrin	2ª	< 0.0176	< 0.0176	ND	ND	ND	ND	ND	ND	ND	
Endrin Ketone	NA	0.00747	0.0118	ND	0.060	ND	ND	NA	NA	NA	
Endosulfan Sulfate	N/A	<0.0025	0.0151	ND	ND	ND	ND	ND	ND	ND	
Gamma Chlordane	2ª	NA	NA	ND	ND	ND	ND	NA	NA	NA	
Heptachlor	0.4ª	< 0.0025	< 0.0025	ND	ND	ND	ND	ND	ND	ND	
Heptachlor epoxide	0.2ª	0.0118	< 0.0063	ND	ND	ND	ND	ND	ND	ND	
Isodrin	N/A	< 0.0025	<0.0025	ND	ND	ND	ND	NA	NA	NA	
Lindane	0.2ª	0.33	0.0448	0.047	0.060	0.035	ND	ND	0.0061 J	0.017 J	
Methoxychlor	40ª	< 0.075	< 0.075	ND	ND	ND	ND	ND	ND	ND	
DDD	0.729	< 0.0081	< 0.0081	ND	ND	ND	ND	ND	ND	0.007 J	
DDE	0.514	< 0.0039	<0.0039	ND	ND	ND	ND	ND	ND	ND	
DDT	0.35	<0.0025	< 0.0025	ND	ND	ND	ND	ND	ND	ND	
Herbicides								}			
2,4,5-T	100ª	NA	0.325	ND	ND	ND	0.300	NA	NA	NA	
2,4,5-TP	50°	NA	0.981	ND	ND	ND	ND	NA	NA	NA	
2,4-D	70 ^a	NA	0.504	ND	.600	ND	0.800	NA	NA	NA	

ND = Not Detected

a = MCL

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Groundwater Sample Results Concentrations in ug/L

I	Fort	Des	Moines.	low
		T C C	エムサ の 単価 かつかり	THOUSE AND

WELL/DATE					Ture inco i		MW-18E	MW-18E	MW-18E	MW-18E
77.22.22.22.22.22.22.22.22.22.22.22.22.2	Action	 		 	 	 	TAT AA -10C	10111-1015	141 AA - 19T	TAT AA - 19E
	Level									
CONSTITUENT	(ug/L)						June 96	Sep 96	Jan 97	June 97
				VERSAR				O.E	IM	<u> </u>
VOCs										
Cis-1,2 Dichloroethene	70ª						ND	ND	ND	ND
1,1-Dichloroethene	7		· · · · · · · · · · · · · · · · · · ·		1		ND	ND	ND	ND
1,2-Dichloroethane	5						NA	NA	NA	NA
m-xylene	N/A						NA	NA	NA .	NA
Acetone	4,000 ^b						NA	NA	NA	ND
Benzene	5 ^a			Ĺ	_		ND	ND	ND	ND
Carbon tetrachloride	5ª						ND			
Methylene chloride	5 ^d						ND	1	4.74	ND
Chlorobenzene	100a						ND	ND	ND	ND
Chloroform	100°						ND	15	6.8	5
Dichlorobenzene (total)	75ª						ND	ND	ND	ND
Ethylbenzene	700°						ND	ND	ND	ND
Tetrachloroethene	5ª						ND	Marital Control	10.000	1827] 虚视
Toluene	1,000ª						ND	2	3	ND
Trichloroethene	5ª						ND	ND	ND	ND
Xylenes (total)	10,000ª						ND	ND	ND	ND
Pesticides			·····							
Aldrin	2°						ND	ND	ND	ND
Alpha-BHC	0.028						ND	ND	ND	ND
Alpha-Chlordane	2 th 2 th						ND	ND	ND	ND
Alpha-Endosulfan		<u> </u>	······································				ND	ND	ND	ND
Beta-BHC	0.097 2 ⁶						0.019	0.04	0.024	ND
Beta-Endosulfan	1 - 1						ND	ND	ND	ND
Chlordane	2ª						ND	ND	ND	ND
Delta-BHC	0.21						ND ·	ND	ND	ND
Dieldrin	2°						0.032	ND	ND	ND
Endrin	2ª						ND	ND	ND	ND
Endrin Ketone	NA					·	ND	ND	ND	ND







WELL/DATE					T	MW-18E	MW-18E	MW-18E	MW-18E
	Action								
	Level		1	1		1	ļ	ĺ	
CONSTITUENT	(ug/L)					June 96	Sep 96	Jan 97	June 97
Endosulfan Sulfate	N/A					ND	ND	ND	ND
Gamma Chlordane	2ª					ND	ND	ND	ND
Heptachlor	0.4 ⁸					ND	ND	ND	ND
Heptachlor epoxide	0.2ª					ND	ND	ND	ND
Isodrin	N/A					ND	ND	ND	ND
Lindane	0.2 ^e					ND	ND	ND	ND
Methoxychlor	40ª					ND	ND	ND	ND
DDD	0.729					ND	ND	ND	ND
DDE	0.514					ND	ND	ND	ND
DDT	0.35					ND	ND	ND	ND
Herbicides									
2,4,5-T	100 ^a					ND	ND	ND	ND
2,4,5-TP	50°					ND	ND	ND	ND
2,4-D	70 ^a					ND	1	ND	ND

ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa







THE REPORT OF THE PARTY OF THE	<u> </u>					TITLES TO AS ST	N /337 1037	A 4117 10117	NATE LOTE	NATE LOSS
WELL/DATE							MW-18W	MW-18W	MW-18W	MW-18W
	Action									
	Level				}		June 96	Sep 96	Jan 97	June 97
CONSTITUENT	(ug/L)	ļ		ERSAR		<u> </u>	Julie 90	OF		Jule 97
VOC-				KKSAIK	T			T UE	 	· · · · · · · · · · · · · · · · · · ·
VOCs Cis-1,2 Dichloroethene	70°						ND	ND	ND	ND
1.1-Dichloroethene	7						ND	ND ND	ND	ND ND
1,2-Dichloroethane	5						NA	NA NA	NA	NA NA
m-xylene	N/A				 		NA	NA NA	NA	NA
Acetone	4.000 ⁶				i i		NA	NA NA	NA NA	ND
Benzene	5°						ND	ND	ND	ND
Carbon tetrachloride	5ª						ND	ND	1.41	ND
Methylene chloride	5 ^d						ND	ND	ND	ND
Chlorobenzene	100ª						ND	ND	ND	ND
Chloroform	100°						ND	ND	1.33	ND
Dichlorobenzene (total)	75 ^a	,					ND	ND	ND	ND
Ethylbenzene	700 ^a						ND	ND	ND	ND
Tetrachloroethene	5 ⁸						ND	4	1519314.5.25	2
Toluene	1,000°						ND	ND	ND	ND
Trichloroethene	5ª						ND	ND	ND	ND
Xylenes (total)	10,000°						ND	ND	ND	ND
Pesticides										
Aldrin	2 ^c						ND	ND	ND	ND
Alpha-BHC	0.028						ND	ND	ND	ND
Alpha-Chlordane	2 ⁸			<u>,</u>			ND	ND	ND	ND
Alpha-Endosulfan	2 ^b						ND	ND	ND	ND
Beta-BHC	0.097						ND	ND	ND	ND
Beta-Endosulfan	2 ⁶						ND	ND	ND	ND:
Chlordane	2 ^a						ND	ND	ND	ND
Delta-BHC	0.21						ND	ND	ND	ND
Dieldrin	2°						0.015	ND	ND	ND
Endrin	2ª						ND .	ND	ND	ND
Endrin Ketone	NA						ND	ND	ND	ND







WELL/DATE				MW-18W	MW-18W	MW-18W	MW-18W
	Action Level						
CONSTITUENT	(ug/L)	 		June 96	Sep 96	Jan 97	June 97
Endosulfan Sulfate	N/A			ND	ND ·	ND	ND
Gamma Chlordane	2 ⁸			ND	ND	ND	ND
Heptachlor	0.4 ⁸			ND	ND	ND	ND
Heptachlor epoxide	0.2ª			ND	ND	ND	ND
Isodrin	N/A			ND	ND	ND	ND
Lindane	0.2ª			ND	ND	ND	ND
Methoxychlor	40°			ND	ND	ND	ND
DDD	0.729			ND	ND	ND	ND
DDE	0.514			ND	ND	ND	ND
DDT	0.35			ND	ND	ND	ND
Herbicides							
2,4,5-T	100 ^a			ND	ND	ND	ND
2,4,5-TP	50°			ND	ND	ND	ND
2,4-D	70ª			ND	4	ND	ND

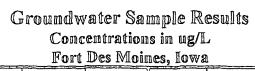
ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa



		Control of the Contro			ATTERNOON AND ADDRESS OF THE PARTY OF THE PA								
WELL/DATE				MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-19S
				19S	198	198	198	19S	198	198	198	198	
-	Action				,]			ļ			
	Level												
CONSTITUENT	(ug/L)			Oct 92	Feb 93	June 96	Sep 96	Jan 97	June	Dec			
······································	 				L				97	99	Mar 00		Aug 00
			VERSAL	<u> </u>			OH	M				CAPE	
VOCs	+===								ļ.,				
Cis-1,2	70°	}		<5	<5	ND	ND	ND	ND	ND	3.1	2.7	ND
Dichloroethene							<u> </u>						
1,1-Dichloroethene	7			NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5			NA	NA	NA	NA	NA	NA	ND	ND	ND	ND
m-xylene	N/A			<1	<1	NA	NA	NA	NA	ND	ND	ND	ND
Acetone	4,000 ⁶			<8	<8	NA	NA	NA	ND	ND	ND	ND	ND
Benzene	5 ⁸			<1	<1	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	5°			2.6	2	ND	3	ND	ND	ND	1.0 J	0.78 J	ND
Methylene chloride	5 ^d			<1	<1	ND	ND	2.46	ND	0.3 J	1.0 J	ND	ND
Chlorobenzene	100°			<1	<1	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	100ª			17	13	1.16	9	3.02	10	ND	4.3	3.2	ND
Dichlorobenzene (total)	75°			<2	<2	ND	ND	ND	ND	ND	ND	ND	ND
<u></u>	700°			<1	<1	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5ª			<1	<1				DAN E	ND	ND	ND	
Tetrachloroethene Toluene				<1	<1			ND		ND	ND ND	ND ND	ND
	1,000°				2.8	ND	ND 3		ND	} 			ND
Trichloroethene				3.3	<2	ND	ND	ND	3	ND	1.8 J	1.5	ND
Xylenes (total)	10,000°			<2		ND	עאן	ND	ND	ND	ND	ND	ND
Pesticides	 												
Aldrin	2°			< 0.0074	< 0.0074	ND	ND	ND	ND	ND	ND	ND	ND
Alpha-BHC	0.028			0.039	0.0278		0.02	ND	ND	ND	F850.0	0.023 J	ND
Alpha-Chlordane	2ª			NA	NA	ND	ND	ND	ND	NA	NA	NA	NA
Alpha-Endosulfan	2 ⁶			<0.0025	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Beta-BHC	0.097			0151		101177	0/2	0.035	ND	ND	[0][3][]]	012年3	ND
Beta-Endosulfan	2 ^b			< 0.0077	<0.0077	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	2ª			< 0.0312	<0.0312	ND	ND	ND	ND	ND	ND	ND	ND
Delta-BHC	0.21			0.0718	0.0483	0.045	0.04	ND	0.028	ND	0.027 J	0.030 J	ND
<u> </u>					1) L						<u> </u>	







WELL/DATE			MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-19S
	1		19S	198	19S	198	198	198	19S	198	198	
	Action Level											
CONSTITUENT	(ug/L)		Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97	Dec 99	Mar 00	June 00	Aug 00
Dieldrin	2°		0.00871	0.0208	0.027	0.01	ND	0.059	ND	0.011 J	0.0092 J	0.014 J
Endrin	2°		<0.0176	<0.0176	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	NA		ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Endosulfan Sulfate	N/A		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND:
Gamma Chlordane	2ª		NA	NA	ND	ND	ND	ND	NA	NA	NA	NA
Heptachlor	0.4ª		<0.0025	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	0.2ª		<0.0063	<0.0063	ND	ND	ND	ND	ND	0.0075 J	ND	ND
Isodrin	N/A		< 0.0025	<0.0025	ND	ND	ND	ND	NA	NA	NA	NA
Lindane	0.2ª		0.0245	0.016	0.045	0.02	ND	0.015	ND	0.012 J	0.015 J	0.019 J
Methoxychlor	40ª		<0.075	<0.075	ND	ND	ND	ND	ND	ND	ND	ND
DDD	0.729		<0.081	<0.081	ND	ND	ND	ND	ND	ND	ND	ND
DDE	0.514		<0.0039	<0.0039	ND	ND	ND	ND	ND	ND	ND	ND
DDT	0.35		<0.0025	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Herbicides												
2,4,5-T	100°		NA	<0.16	ND	ND	ND	0.1		NA	NA	NA
2,4,5-TP	50°		NA	<0.095	ND	ND	ND	ND][NA	NA	NA
2,4-D	70°		NA	<0.263	ND	0.500	ND	0.3		NA	NA	NA

ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

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WELL/DATE				MW- 19D	MW- 19D	MW- 19D	MW- 19D	MW- 19D	MW- 19D	MW- 19D	MW- 19D	MW- 19D	MW- 19D
	Action			172	170	1,75	1,72	172	175	175	1	170	100
CONSTITUENT	Level (ug/L)			Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97	Dec 99	Mar 00	June 00	Aug 00
	ļ(VERSAF	<u> </u>	·	-	OH	IM	· · · · · · · · · · · · · · · · · · ·	 		CAPE	
VOCs	70°		 ····	<5	<5	ND	ND	ND	ND	ND	ND	NID	
Cis-1,2 Dichloroethene												ND	
1,1-Dichloroethene	7		 	NA	NA	ND	ND	ND	ND	ND	ND	0.21 J	
1,2-Dichloroethane	5		 	NA	NA	NA	NA	NA	NA	ND	ND	ND	ļ
m-xylene	N/A		 	<1	<1	NA	NA	NA	NA	NA	NA	ND	1201
Acetone	4,000 ^b		 <u> </u>	<8	<8	NA	NA	NA	ND	ND	ND	ND	2.8 J
Benzene			 	<1	<1	ND	ND	ND	ND	ND	ND	ND	ļ
Carbon tetrachloride	5ª			<1	<1	ND	ND	ND	ND	ND	ND	ND	
Methylene chloride	5 ^d			<1	<1	ND	ND	1.14	ND	ND	0.29 J	ND	
Chlorobenzene	100°			<1	<1	ND	ND	ND	ND	ND	ND	ND	
Chloroform	100°		 	<1	<1	ND	ND	ND	ND	ND	ND	ND	
Dichlorobenzene (total)	75ª			<2	<2	ND	ND	ND	ND	ND	ND	ND	
Ethylbenzene	700 ^a		 	<1	<1	ND	ND	ND	ND	ND	ND	ND	
Tetrachloroethene	5 ⁸				<1	ND	ND	ND	ND	ND	ND	ND	
Toluene	1,000°			1	8.7	ND	ND	ND	ND	0.11 J	ND	ND	
Trichloroethene	5°			<1	<1	ND	ND	ND	ND	ND	ND	ND	
Xylenes (total)	10,000 ^a			<2	<2	ND	ND	ND	ND	ND	ND	ND	
Pesticides	+									<u> </u>		 	
Aldrin	2°			< 0.0074	< 0.0074	ND	ND	ND	ND	ND	ND	ND	
Alpha-BHC	0.028			0.0025	< 0.0025	ND	ND	ND	ND	ND	ND	ND	
Alpha-Chlordane	2ª			NA	ŅA	ND	ND	ND	ND	NA	NA	NA	
Alpha-Endosulfan	2 ^b			<0.0025	<0.0025	ND	ND	ND	ND	ND	ND	ND	
Beta-BHC	0.097			<0.0099	<0.0099	ND	ND	ND	ND	ND	ND	ND	
Beta-Endosulfan	2 ^b			<0.0077	< 0.0077	ND	ND	ND	ND	ND	ND	ND	
Chlordane	2ª			<0.0312	< 0.0312	ND	ND	ND	ND	ND	ND	ND	







WELL/DATE			MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-	MW-
			19D	19D	19D	19D	19D	19D	19D	19D	19D	19D
	Action Level											
CONSTITUENT	(ug/L)		Oct 92	Feb 93	June 96	Sep 96	Jan 97	June 97	Dec 99	Mar 00	June 00	Aug 00
Delta-BHC	0.21		< 0.0034	< 0.0034	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	2°		< 0.0074	< 0.0074	0.015	ND	ND	ND	ND	ND	ND	ND
Endrin	2ª		< 0.0176	< 0.0176	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	NA		ND	<0.0025	ND	ND	ND	ND	NA	NA	NA	NA
Endosulfan Sulfate	N/A		0.00625	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Gamma Chlordane	2 ⁸		NA	NA	ND	ND	ND	ND	NA	NA	NA	NA
Heptachlor	0.4ª		< 0.0025	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	0.2ª		< 0.0063	< 0.0063	ND	ND	ND	ND	ND	ND	ND	ND
Isodrin	N/A		< 0.0025	<0.0025	ND	ND	ND	ND	NA	NA	NA	NA
Lindane	0.2ª		< 0.0025	< 0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	40 ^a		< 0.075	<0.075	ND .	ND	ND	ND	ND	ND	ND	ND
DDD	0.729		< 0.0081	<0.081	ND	ND	ND	ND	ND	ND	ND	ND
DDE	0.514		0.0063	< 0.0039	ND	ND	ND	ND	ND	ND	ND	ND
DDT	0.35		0.00312	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Herbicides												
2,4,5-T	100ª		NA	<0.16	ND	ND	ND	ND	NA	NA	NA	NA
2,4,5-TP	50ª		NA	<0.095	ND	ND	ND	ND	NA.	NA	NA	NA
2,4-D	70°		NA NA	<0.263	ND	0.5	ND_	0.1	NA	NA	NA	NA

ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa







		 						=====
WELL/DATE				MW-20	MW-20	MW-20	MW-20	MW-20
	Action							
	Level							
CONSTITUENT	(ug/L)			Feb 93	June 96	Sep 96	Jan 97	June 97
		 VERSAR	·			OF	IM	
VOCs			~					
Cis-1,2 Dichloroethene	70ª			<5	ND	ND	ND	ND
1,1-Dichloroethene	7			NA	ND	ND	ND	ND
1,2-Dichloroethane	5			NA	NA	NA	NA	NA
m-xylene	N/A			<1	NA	NA	NA	NA
Acetone	4,000 ^b			<8	NA	NA	NA	ND
Benzene	5ª			<1	ND	ND	ND	ND
Carbon tetrachloride	5ª			<1	ND	ND	ND	ND
Methylene chloride	5 ^d			<1	ND	ND	ND	ND
Chlorobenzene	100ª			<1	ND	ND	ND	ND
Chloroform	100 ^a			<1	ND	ND	ND	ND
Dichlorobenzene (total)	75ª			NA	ND	ND	ND	ND
Ethylbenzene	700°			<1	ND	ND	ND	ND
Tetrachloroethene	5ª			<1	ND	ND	ND	ND
Toluene	1,000°			2,3	ND	ND	ND	ND
Trichloroethene	5ª			<1	ND	ND	ND	ND
Xylenes (total)	10,000ª			<2	ND	ND	ND	ND
Pesticides								
Aldrin	2°			< 0.0074	ND	ND	ND	ND
Alpha-BHC	0.028			< 0.0025	ND	ND	ND	ND
Alpha-Chlordane	2 ⁸			NA	ND	ND	ND	ND
Alpha-Endosulfan	2 ^b			< 0.0025	ND	ND	ND	ND
Beta-BHC	0.097			<0.0099	ND	ND	ND	ND
Beta-Endosulfan	2 ⁶			< 0.0077	ND	ND	ND	ND
Chlordane	2ª			<0.0312	ND	ND	ND	ND
Delta-BHC	0.21			< 0.0034	ND	ND	ND	ND
Dieldrin	2 ^e			< 0.0074	ND	ND	ND	ND
Endrin	2ª			< 0.0176	ND	ND	ND	ND
Endrin Ketone	NA			ND	ND	ND	ND	ND







WELL/DATE			T	MW-20	MW-20	MW-20	MW-20	MW-20
	Action Level							
CONSTITUENT	(ug/L)			Feb 93	June 96	Sep 96	Jan 97	June 97
Endosulfan Sulfate	N/A			0.00445	ND	ND	ND	ND
Gamma Chlordane	2 ^s			NA	ND	ND	ND	ND
Heptachlor	0.4ª			<0.0025	ND	ND	ND	ND
Heptachlor epoxide	0.2ª			<0.0063	ND	ND	ND	ND
Isodrin	N/A			<0.0025	ND	ND	ND	ND
Lindane	0.2ª			<0.0025	0.045	0.02	ND	0.015
Methoxychlor	40 ^a	·		<0.075	ND	ND	ND	ND
DDD	0.729			<0.081	ND	ND	ND	ND
DDE	0.514			<0.0039	ND	ND	ND	ND
DDT	0.35			<0.0025	ND	ND	ND	0.012
Herbicides								
2,4,5-T	100°			<0.16	ND	ND	ND	ND
2,4,5-TP	50 ^a			<0.095	ND	ND	ND	ND
2,4-D	70ª			<0.263	ND	ND	ND	ND

Notes: NA = Not Analyzed ND = Not Detected

a = MCL

b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa







WELL/DATE			MW-21		MW-21	MW-21	MW- 21	MW- 21	MW- 21	MW-21	MW-21
CONSTITUENT	Action Level (ug/L)		Feb 93	June 96	Sep 96	Jan 97	June 97	Dec 99	Mar 00	June 00	Aug 00
		VERSAL	\$		OH	IM	. 			APE	<u> </u>
VOCs								1			
Cis-1,2 Dichloroethene	70°		<5	ND	ND	ND	ND		ND	ND	ND
1,1-Dichloroethene	7		NA	NA	ND	ND	ND		ND	0.28 J	ND
1,2-Dichloroethane	5		NA _	NA	NA	NA	NA		ND	ND	ND
m-xylene	N/A		<1	NA	NA	NA	NA		NA	ND	ND
Acetone	4,000 ⁶		<8	NA	NA	NA	ND		ND	ND	2.6 J
Benzene	5°		<1	ND	ND	ND	ND		ND	ND	ND
Carbon tetrachloride	5°		<1	ND	ND	ND	ND		ND	ND	ND
Methylene chloride	5 ^d		<1	ND	ND	ND	ND		0.58 J	ND	ND
Chlorobenzene	100ª		<1	ND	ND	ND	ND		ND	ND	ND
Chloroform	100a		<1	ND	ND	ND	ND		0.041	0.44 J	ND
Dichlorobenzene (total)	75°		<2	ND	ND	ND	ND	 	ND	ND	ND
Ethylbenzene	700 ^a	•	<1	ND	ND	ND	ND		ND	ND	ND -
Tetrachloroethene	5ª		<1	ND	ND	ND	ND		ND	ND	ND
Toluene	1,000°		2.9	ND	ND	ND	ND	1	ND	ND	ND
Trichloroethene	5 ⁸		<1	ND	ND	ND	ND		ND	ND	ND
Xylenes (total)	10,000°		<2	ND	ND	ND	ND		ND	ND	ND
Pesticides	 		 			†	 				
Aldrin	2°		<0.0074	ND	ND	ND	ND		ND ·	ND	ND
Alpha-BHC	0.028		< 0.0025	ND	ND	ND	ND		ND	ND	ND
Alpha-Chlordane	2ª		NA	ND	ND	ND	ND		NA	NA	NA
Alpha-Endosulfan	2 ⁶		< 0.0025	ND	ND	ND	ND	1	ND	ND	ND
Beta-BHC	0.097		< 0.0099	ND	ND	ND	ND	1	ND	ND	ND
Beta-Endosulfan	2 ^b		< 0.0077	ND	ND	ND	ND	 	ND	ND	ND
Chlordane	2ª		< 0.0312	ND	ND	ND	ND		ND	ND	ND
Delta-BHC	0.21		< 0.0034	ND	ND	ND	ND	1	ND	ND	ND







WELL/DATE		MW-21	MW-21	MW-21	MW-21	MW- 21	MW- 21	MW 21	MW-21	MW-21
CONOUNTAINENT	Action Level	Feb 93	June 06	Son 06	Ion 07	-				
CONSTITUENT	(ug/L)	reb 93	June 96	Sep 96	Jan 97	June 97	Dec 99	Mar 00	June 00	Aug 00
Dieldrin	2°	<0.0074	ND	ND	ND	ND	ND	ND	ND	ND
Endrin	2ª	<0.0176	ND	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	NA	ND	ND	ND	ND	ND	NA	NA	NA	NA
Endosulfan Sulfate	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND
Gamma Chlordane	2ª	NA	ND	ND	ND	ND	NA	NA	NA	NA
Heptachlor	0.4ª	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	0.2ª	<0.0063	ND	ND	ND	ND	ND	ND	ND	ND
Isodrin	N/A	0.00513	ND	ND	ND	ND	NA	NA	NA	NA
Lindane	0.2ª	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	40 ⁸	<0.075	ND	ND	ND	ND	ND	ND	ND	ND
DDD	0.729	<0.081	ND	ND	ND	ND	ND	ND	ND	ND
DDE	0.514	<0.0039	ND	ND	ND	ND	ND	ND	ND	ND
DDT	0.35	<0.0025	ND	ND	ND	ND	ND	ND	ND	ND
Herbicides										
2,4,5-T	100°	<0.16	ND	ND	ND	ND	NA	NA	NA	NA
2,4,5-TP	50°	<0.095	ND	ND	ND	ND	NA	NA	NA	NA
2,4-D	70°	<0.263	ND	ND	ND	ND	NA	NA	NA	NA

ND = Not Detected

a = MCL

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						11.001	TIMES IN	LOUBLE OF	TO AA ST					
WELL/DATE]	. 1								MW	MW	MW	MW	MW
	1			ļ	ļ	1]	1	96-1	96-1	96-1	96-1	96-1
										1				
Name of the state					ļ		<u> </u>							
	Action							Ì	ļ					
~~~	Level			Ì				1			_			
CONSTITUENTS	(ug/L)				}		Įļ			Aug 96	Dec	Mar	June	Aug
	<b></b>	I	77.77	1 TO C A TO 44	l .	<u> </u>	<b> </b>	L		ļ	99	00	00	00
VOCs	<del> </del>		A TR	ERSAR/	DIHTIMI		<b></b>	ı U	SACE	1		T CA	PE_	Γ
	70ª	B.4	[anitaria	ag Wall 3	Nat Came	lad	<b></b>	<b></b>		ND	<u> </u>	ND	370	200
Cis-1,2 Dichloroethene	/0	10	юшюн	ig weit i	Not Samp	neu	1			I ND	ND	ND	ND	ND
	7			Τ	T	Τ	<b>∦</b>	<u> </u>		ND	100	NID	ND	NID
1,1-Dichloroethene	5			<del> </del>	<del> </del>	ļ	-	ļ	-	ND ND	ND	ND	ND	ND
1,2-Dichloroethane	1 1				<del> </del>	ļ	<b>∤</b>	ļ			ND	ND	ND	ND
m-xylene	N/A				<del> </del>	ļ	<b> </b>	<b>}</b>	<b></b>	NA	ND	ND	ND	ND
Acetone	4,000 ^b				ļ	<u> </u>	<b> </b>	<b> </b> -		ND	3,3 J	ND	ND	ND
Benzene	1 1		<del></del>		ļ					ND	ND	ND	ND	ND
Carbon tetrachloride	5 ⁸		_				ļ			2.3 J	ND	0.24 J	0.39 J	ND
Methylene chloride	5 ^d									ND	ND	0.54 J	ND	ND
Chlorobenzene	100ª									ND	ND	ND	ND	ND
Chloroform	100°									ND	ND	0.13 J	ND	ND
Dichlorobenzene	75ª		···							ND	ND	ND	ND	ND
(total)				1										1
Ethylbenzene	700 ^a									ND	ND	ND	ND	ND
Tetrachloroethene	5°									1.3 J	ND	0.41 J	0.74 J	ND
Toluene	1,000ª								1	ND	ND	ND	ND	ND
Trichloroethene	5 ⁸		<del></del>		T :					1.3 J	ND	ND	ND	ND
Xylenes (total)	10,000ª									ND	ND	ND	ND	ND
Pesticides														
Aldrin	2°									ND	ND	ND	ND	ND
Alpha-BHC	0.028									图:05 2元	ND	ND	ND	ND
Alpha-Chlordane	2ª									NA	NA	NA	NA	NA
Alpha-Endosulfan	2 ⁶									ND	ND	ND	ND	ND
Beta-BHC	0.097		······································							\$0.01\f	ND	ND	ND	ND
Beta-Endosulfan	2 ^b			<del>                                     </del>	T	1	·	1	1	ND	ND	ND	ND	ND







WELL/DATE				T			MW	MW	MW	MW	MW
							96-1	96-1	96-1	96-1	96-1
	Action Level				1						
CONSTITUENTS	(ug/L)						Aug 96	Dec 99	Mar 00	June 00	Aug 00
Chlordane	2ª						ND	ND	ND	ND	ND
Delta-BHC	0.21						ND	ND	ND	ND	ND
Dieldrin	2°						ND	ND	0.010 J	0.011 J	0.015 J
Endrin	2ª					Ì	ND	ND	ND	ND	ND
Endrin Ketone	NA							NA	NA	NA	NA
Endosulfan Sulfate	N/A						ND	ND	ND	ND	ND
Gamma Chlordane	2ª						NA	NA	NA	NA	NA
Heptachlor	0.4ª					Ì	ND	ND	ND	ND	ND
Heptachlor epoxide	0.2ª						ND	ND	ND	ND	ND
Isodrin	N/A						NA	NA	NA	NA	NA
Lindane	0.2ª						ND	ND	ND	ND	ND
Methoxychlor	40ª						ND	ND	ND	ND	ND
DDD	0.729						ND	ND	ND	ND	ND
DDE	0.514						ND	ND	ND	ND	ND
DDT	0.35						ND	ND	ND	ND	ND
Herbicides			_	-							<del> </del>
2,4,5-T	100ª						ND	NA	NA	NA	NA
2,4,5-TP	50 ⁸						ND	NA	NA	NA	NA
2,4-D	70°			1			ND	NA	NA	NA	NA

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WELL/DATE	Γ		<del></del>	<del></del>	T		משות פכשווו	MW	MW	MW	MW	MW
	1 1	1	-				1	96-2	96-2	96-2	96-2	96-2
		Į			1			70-2	70-2	70-2	70-2	70-2
										1		
	Action											
1	Level											
CONSTITUENTS	(ug/L)							Aug	Dec	Mar	June	Aug
								96	99	00	00	00
			ERSARIO	DHIM			USAC	Œ		CA	APE .	
VOCs		_							<u> </u>	<u> </u>		<u> </u>
Cis-1,2	70°	Monitor	ing Well N	Vot Samp	oled .			. <20	Monito	oring We	II Not Sai	npled
Dichloroethene				·		<u></u>						
1,1-Dichloroethene	7			<u> </u>				32000 A				
1,2-Dichloroethane	5							SC20-7		<u> </u>		
m-xylene	N/A							NA	<u> </u>	ļ		
Acetone	4,000 ^b			<u> </u>				<500				<u> </u>
Benzene	5°			İ				200				
Carbon tetrachloride	5ª											
Methylene chloride	5 ^d											
Chlorobenzene	100ª							<20				
Chloroform	100ª					·		<b>博60</b> 事業				
Dichlorobenzene	75ª							4 J				
(total)												
Ethylbenzene	700°							<20				
Tetrachloroethene	5ª							至1100年程				
Toluene	1,000ª							<20			]	
Trichloroethene	5°							<b>经20</b> 上面)				
Xylenes (total)	10,000°							<20		·		
Pesticides	-			-	<del></del>				<u> </u>	<del> </del>	-	ļ
Aldrin	2°							<2	<del> </del>	+	<del> </del>	<del> </del>
				<del></del>				183117.2	<b> </b>	<del> </del>	<del> </del>	<del> </del>
Alpha Chlordena	0.028 2ª					ļ		NA NA			<del> </del>	<del> </del>
Alpha-Chlordane	26							NA   <2	J		<del> </del>	<del> </del> -
Alpha-Endosulfan						<b> </b>			<b> </b>	<del> </del>	<u> </u>	<del> </del>
Beta-BHC	0.097			<del>-</del>						<b></b>		ļ,
Beta-Endosulfan	2 ^b						1	153 TEL				







WELL/DATE					<del></del>			MW	MW	MW	MW	MW
								96-2	96-2	96-2	96-2	96-2
	Action		_	<del> </del>	<del> </del>	-∦			<b> </b>	-	<del> </del>	<del> </del>
	Level				1							
CONSTITUENTS	(ug/L)							Aug 96	Dec 99	Mar 00	June 00	Aug 00
Chlordane	2ª					1		<del>                                      </del>	i		<del> </del>	1
Delta-BHC	0.21	Monitori	ng Well N	ot Samp	led				Moni	toring W	ell Not S	ampled
Dieldrin	2°											T
Endrin	2ª							<3				
Endrin Ketone	NA				1			NA				
Endosulfan Sulfate	N/A		7				-	<3		<u> </u>		1
Gamma Chlordane	2ª				1			NA		<b></b>		<del> </del>
Heptachlor	0.4ª											<del>                                     </del>
Heptachlor epoxide	0.2ª	<del></del>								<u> </u>		
Isodrin	N/A							NA				1
Lindane	0.2ª							17-12-1				
Methoxychlor	40 ⁸							<6				
DDD	0.729			7								
DDE	0.514			1				<b>30:14</b>				
DDT	0.35										1	
											1	
Herbicides												
2,4,5-T	100 ^a				1			<4				
2,4,5-TP	50°							<4				
2,4-D	70°							<4			<u> </u>	

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WELL/DATE									MW 99-3	MW 99-3	MW 99-3	MW 99-3
	Action	 			<b> </b>		<del> </del>		1	122	77.3	77-3
	Level					<u> </u>		}				
CONSTITUENTS	(ug/L)								Dec	Mar	June	Aug
	<b> </b>			<u> </u>	<b> </b>	L	<u> </u>	<u> </u>	99	00	00	00
		 VERSA	<u>R</u>		<u> </u>	0	MHI		<b> </b>	<u>CA</u>	PE	
VOCs			_		<u> </u>	ļ			ļ			
Cis-1,2 Dichloroethene	70 ⁸								ND	ND	ND	ND
1,1-Dichloroethene	7								ND	ND	ND	ND
1,2-Dichloroethane	5								ND	ND	ND	ND
m-xylene	N/A								ND	ND	ND	ND
Acetone	4,000 ^b				1				ND	ND	ND	2.5 J
Benzene	5 ⁸		_		İ				ND	ND	ND	ND
Carbon tetrachloride	5ª								ND	ND	ND	ND
Methylene chloride	5 ^d								0.21 J	0.28 J	ND	ND
Chlorobenzene	100°								ND	ND	ND	ND
Chloroform	100°								ND	ND	ND	ND
Dichlorobenzene	75 ⁸								ND	ND	ND	ND
(total)			_									
Ethylbenzene	700 ^a								ND	ND	ND	ND
Tetrachloroethene	5 ^a								ND	0.42 J	ND	ND
Toluene	1,000ª					<u> </u>			ND	ND	ND	ND
Trichloroethene	5ª						ļ <u>-</u>		ND	0.11 J	ND	ND
Xylenes (total)	10,000°	 				ļ	<del> </del>		ND	ND	ND	ND
Pesticides		 	<del>-  </del>	<del>                                     </del>	<b> </b>	<del> </del>	+	<del>                                     </del>	-		-	<del>                                     </del>
Aldrin	2°								ND	ND	ND	ND
Alpha-BHC	0.028								ND	ND	ND	ND
Alpha-Chlordane	2 ⁸								NA	NA	NA	NA
Alpha-Endosulfan	2 ^b								ND	ND	ND	ND
Beta-BHC	0.097								ND	ND	ND	ND
Beta-Endosulfan	2 ^b								ND	ND	ND	ND
Chlordane	2ª								ND	ND	ND	ND
Delta-BHC	0.21								ND	ND	ND	ND







WELL/DATE								MW 99-3	MW 99-3	MW 99-3	MW 99-3
	Action Level							1 77-3	77-3	99-3	1 27-3
CONSTITUENTS	(ug/L)					1		Dec 99	Mar 00	June 00	Aug 00
Dieldrin	2°							ND	ND	ND	ND
Endrin	2ª					1		ND	ND	ND	ND
Endrin Ketone	NA					Î	-	NA	NA	NA	NA
Endosulfan Sulfate	N/A							ND	ND	ND	ND
Gamma Chlordane	2ª							NA	NA	NA	NA
Heptachlor	0.4ª	İ		*******************************				·ND	ND	ND	ND
Heptachlor epoxide	0.2ª	İ						ND	ND	ND	ND
Isodrin	N/A					Ì		NA	NA	NA	NA
Lindane	0.2ª				· ·			ND	ND	ND	ND
Methoxychlor	40ª							ND	ND	ND	ND
DDD	0.729							ND	ND	ND	ND
DDE	0.514							ND	ND	ND	ND
DDT	0.35							ND	ND	ND	ND
Herbicides											
2,4,5-T	100°							NA	NA	NA	NA
2,4,5-TP	50ª							NA	NA	NA	NA
2,4-D	70°							NA	NA	NA	NA

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					TOTE II	PCS IVIIO	المال وقعاللا	77 60	 			
WELL/DATE		,		}					MW	MW	MW	MW
		1	ļ				}		99-4	99-4	99-4	99-4
	Action											
	Level											
CONSTITUENTS	(ug/L)		1		ľ				Dec9	Mar	June	Aug
									9	00	00	00
			VERSA	AR			OI	IMI		CA	PE	
VOCs												
Cis-1,2	70ª								ND	ND	28	ND
Dichloroethene												
1,1-Dichloroethene	7								ND	ND	ND_	ND
1,2-Dichloroethane	5	l							ND	ND	ND	ND
m-xylene	N/A								 ND	ND	ND	ND
Acetone	4,000 ^b	LL_							 ND	ND	ND	ND
Benzene	5ª								ND	ND	ND	ND
Carbon tetrachloride	5ª								ND	3.4 J	3.3	ND
Methylene chloride	5 ^d								0.76 J	2.1 J	ND	ND
Chlorobenzene	100°								ND	ND	ND	ND
Chloroform	100ª								 ND	4.4	4.1	ND
Dichlorobenzene (total)	75ª								ND	ND	ND	ND
Ethylbenzene	700ª								ND	ND	ND	ND
Tetrachloroethene	58	<del>  </del>							ND	ND	1601172	ND
Toluene	1,000ª								 ND	ND	ND	ND
Trichloroethene	5ª								ND	273	1710	ND
Xylenes (total)	10,000°			1	<del>                                     </del>				ND	ND	ND	ND
Pesticides												
Aldrin	2°								ND	ND	ND	ND
Alpha-BHC	0.028								ND	DEIG.	10.35	ND
Alpha-Chlordane	2ª			_		}			NA	NA	NA	NA
Alpha-Endosulfan	26				1				ND	ND	ND	0.006
												7 J
Beta-BHC	0.097								ND	0183	045	ND
Beta-Endosulfan	2 ^ь								ND	ND	ND	ND
Chlordane	2ª								ND	ND	ND	ND







WELL/DATE						MW 99-4	MW 99-4	MW 99-4	MW 99-4
	Action Level					 33-4	33-4	33-4	77-4
CONSTITUENTS	(ug/L)					Dec9	Mar 00	June 00	Aug 00
Delta-BHC	0.21			<u> </u>			0.15	0.15	
Dieldrin	2°					0.019 J	0.020 J	0.019 J	0.025 J
Endrin	2ª					ND	ND	ND	ND
Endrin Ketone	NA					NA	NA	NA	NA
Endosulfan Sulfate	N/A					ND	ND	ND	ND
Gamma Chlordane	2ª					NA	NA	NA	NA
Heptachlor	0.4ª					ND	ND	ND	ND
Heptachlor epoxide	0.2ª				-	ND	0.006 4 J	0.011 J	0.008 6 J
Isodrin	N/A					NA	NA	NA	NA
Lindane	0.2ª		1			ND	0.084	0.089	ND
Methoxychlor	40ª	İ				ND	ND	ND	ND
DDD	0.729		<u> </u>			ND	ND	ND	ND
DDE	0.514					ND	0.009 2 J	ND	0.014 J
DDT	0.35					ND	ND	ND	ND
Herbicides									
2,4,5-T	100ª					 NA	NA	NA	NA
2,4,5-TP	50 ⁸					NA	NA	NA	NA
2,4-D	70°					NA	NA	NA	NA

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				<del></del>			аполинея и		<del></del>					
WELL/DATE		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
		99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5
CONSTITUENTS	Action Level (ug/L)	Mar 91	Jul 91	Dec 91 VERSAR	Oct 92	Feb 93	Jun 96	Sep 96	Jan 97	Jun 97	Dec 99	Mar 00	Jun 00 CAPE	Aug 00
VOCs				A TOTAL OF A		I	<b> </b>		T T	T	<b></b>	<u>`</u>	XXII III	
Cis-1.2	70°		<del> </del>					<del> </del>		<b> </b>	ND	5.0	4.6	ND
Dichloroethene							<u> </u>				<u> </u>			
1,1-Dichloroethene	7										ND	ND	ND	ND
1,2-Dichloroethane	5										ND	ND	ND	ND
m-xylene	N/A										ND	ND	ND	ND
Acetone	4,000 ⁶										ND	ND	ND	ND
Benzene	5ª										ND	ND	ND	ND
Carbon tetrachloride	5ª										ND	0.93 J	0.28 J	ND
Methylene chloride	5 ^d										0.38 J	1.1 J	ND	ND
Chlorobenzene	100ª										ND	ND	ND	ND
Chloroform	100°										ND	1.8 J	0.66 J	ND
Dichlorobenzene (total)	75ª										ND	ND	ND	ND
Ethylbenzene	700 ^a										ND	ND	ND	ND
Tetrachloroethene	5ª										ND	ND	49	ND
Toluene	1,000ª										ND	ND	ND	ND
Trichloroethene	5ª										ND	2.4	2.2	ND
Xylenes (total)	10,000 ^a										ND	ND	ND	ND
Pesticides			<del> </del>	<del> </del>		<del> </del>	<b> </b>	<del> </del>	<del> </del>	<del> </del>	<del>  </del>	<del> </del> -		
Aldrin	2°	<b> </b>	<del> </del>			<del> </del>	<del> </del>	<del> </del>	<del> </del> -	<del> </del>	ND	ND	ND	ND
Alpha-BHC	0.028		<del> </del>			<del>                                     </del>	1		<del> </del>		ND	0.10	0.092	
Alpha-Chlordane	2ª		-	<del> </del>		<del> </del>	<b> </b>		<del> </del>	-	NA	NA	NA	NA
Alpha-Endosulfan	26			<del> </del>	<u> </u>		<b> </b>	<del>                                     </del>	<del>                                     </del>	<del> </del>	ND	ND	ND	ND
Beta-BHC	0.097										ND	0115	0.12	ND
Beta-Endosulfan	26	<b> </b>	<del>                                     </del>					<b>†</b>	<del>                                     </del>		ND	ND	ND	ND
Chlordane	2ª								<b>†</b>		ND	ND	ND	ND







WELL/DATE		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
		99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5	99-5
CONSTITUENTS	Action Level (ug/L)	Mar 91	Jul 91	Dec 91	Oct 92	Feb 93	Jun 96	Sep 96	Jan 97	Jun 97	Dec 99	Mar 00	Jun 00	Aug 00
Delta-BHC	0.21										ND	0.03 2 J	0.029 J	ND
Dieldrin	2°										ND	0.00 93 J	ND	ND
Endrin	2ª							<del>\</del>			ND	ND	ND	ND
Endrin Ketone	NA										NA	NA	NA	NA
Endosulfan Sulfate	N/A										ND	ND	ND	ND
Gamma Chlordane	2ª										NA	NA	NA	NA
Heptachlor	0.4ª										ND	ND	ND	ND
Heptachlor epoxide	0.2ª										ND	0.00 72 J	ND	ND
Isodrin	N/A				·						NA	NA	NA	NA
Lindane	0.2ª										ND	0.05	0.054	ND
Methoxychlor	40°										ND	ND	ND	ND
DDD	0.729										ND	ND	ND	ND
DDE	0.514										ND	ND	ND	ND
DDT	0.35										ND	ND	ND	ND
Herbicides														
2,4,5-T	100°										NA	NA	NA	NA
2,4,5-TP	50 ⁸										NA	NA	NA	NA
2,4-D	70°										NA.	NA	NA	NA

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WELL/DATE									T		MW	MW	MW	MW
	}	, }				\ '					99-6	99-6	99-6	99-6
	Action													
	Level	. }							İ			İ		
CONSTITUENTS	(ug/L)	, ,		1							Dec	Mar	June	Aug
											99	00	00.	00
			7	VERSA	R			OH	IM			· CA	PE	
VOCs														
Cis-1,2	70 ^a			(			<b>∭</b>				ND	2.0	0.79 J	ND
Dichloroethene				<u> </u>			<b></b>							
1,1-Dichloroethene	7	ļ				ļ					ND	ND	ND	ND
1,2-Dichloroethane	5	L		Ĺ							ND	ND	ND	ND
m-xylene	N/A										ND	ND	ND	ND
Acetone	4,000 ^b										ND	ND	ND	2.5 J
Benzene	5 ^a										ND	ND	ND	ND
Carbon tetrachloride	5°										ND	ND	ND	ND
Methylene chloride	5 ^d										ND	0.39 J	ND	ND
Chlorobenzene	100ª										ND	ND	ND	ND
Chloroform	100ª										ND	ND	ND	ND
Dichlorobenzene	75ª										ND	ND	ND	ND
(total)														
Ethylbenzene	700ª		<u> </u>				<u> </u>				ND	ND	ND	ND
Tetrachloroethene	5ª			<u> </u>			<b>I</b>				ND	ND	ND	ND
Toluene	1,000°			<u> </u>			<b></b>				ND	ND	ND	ND
Trichloroethene	5 ⁸			<u> </u>							ND	0.82 J	0.26 J	ND
Xylenes (total)	10,000ª			<u> </u>	<u> </u>		-				ND	ND	ND	ND
	ļ			<b> </b>	<del></del>		-∥					<u> </u>	<u> </u>	ļ
Pesticides	<u> </u>				<u> </u>							<u> </u>	<u> </u>	<del> </del>
Aldrin	2°				<del></del>						ND	ND	ND	ND
Alpha-BHC	0.028	<u> </u>									ND	ND	ND	ND
Alpha-Chlordane	2ª			ļ		ļ	<u> </u>	<u> </u>			NA	NA	NA	NA
Alpha-Endosulfan	2 ^b										ND	ND	ND	ND
Beta-BHC	0.097			<u> </u>			J				ND	ND	ND	ND
Beta-Endosulfan	2 ^b										ND	ND	ND	ND
Chlordane	2 ^a									,	ND	ND	ND	ND
Delta-BHC	0.21						-				ND	ND	ND	ND







WELL/DATE							MW 99-6	MW 99-6	MW 99-6	MW 99-6
CONSTITUENTS	Action Level (ug/L)						Dec 99	Mar	June	Aug
Dieldrin	2°				<b></b>		ND ND	00   ND	ND	ND
Endrin	2ª			1	1	<del> </del>	ND	ND	ND	ND
Endrin Ketone	NA				1		NA	NA	NA	NA
Endosulfan Sulfate	N/A						ND	ND	ND	ND
Gamma Chlordane	2ª						NA	NA	NA	NA
Heptachlor	0.4 ⁸						ND	ND	ND	ND
Heptachlor epoxide	0.2ª						ND	ND	ND	ND
Isodrin	N/A						NA	NA	NA	NA
Lindane	0.2 ^a						ND	ND	ND	ND
Methoxychlor	40ª						ND	ND	ND	ND
DDD	0.729						ND	ND	ND	ND
DDE	0.514						ND	ND	ND	ND
DDT	0.35						ND	ND	ND	ND
Herbicides		<u> </u>								
2,4,5-T	100 ^a						NA	NA	NA	NA
2,4,5-TP	50 ^a						NA	NA	NA	NA
2,4-D	70 ^a						NA	NA	NA	NA

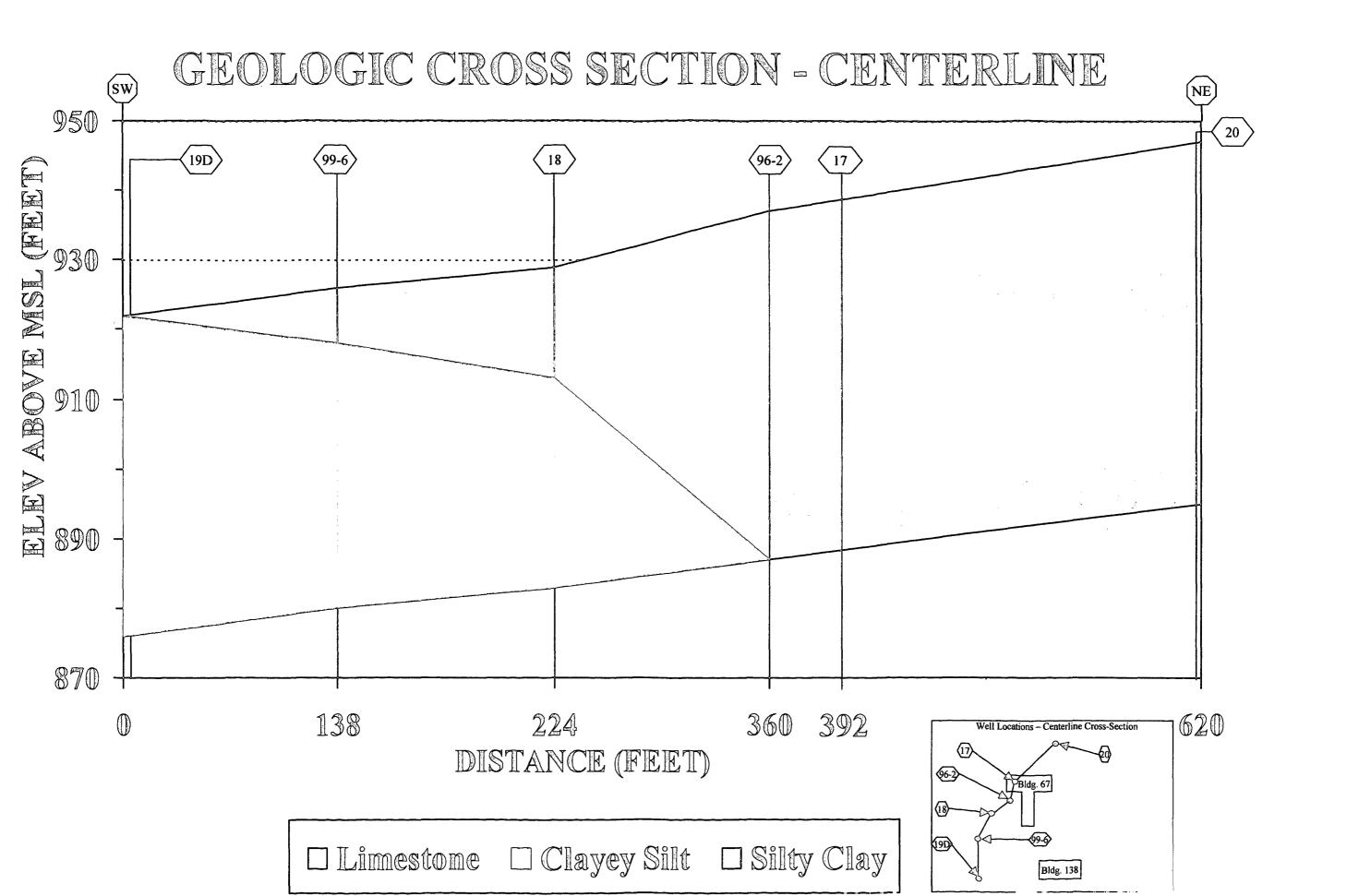
ND = Not Detected

a = MCL

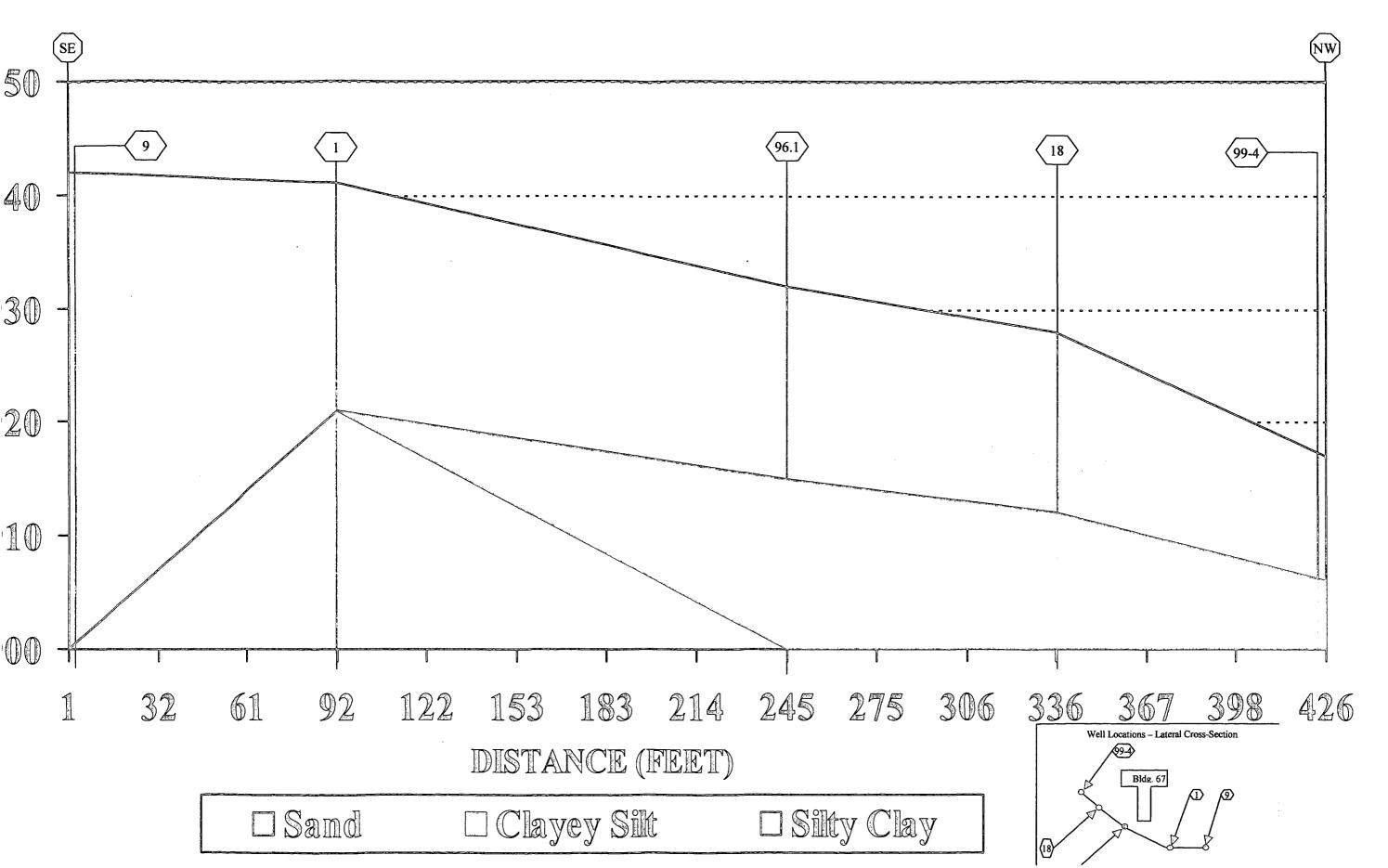
b = RFI (RCRA Facility Investigation) - Health-Based Criteria for Carcinogens and Systemic Toxicants, Tables 8-6 & 8-7, May 1989.

c = HAL - Lifetime Health Advisory Level for a Contaminant, State of Iowa

d = NRL - Negligible Risk Level for Carcinogens, State of Iowa



#### GEULUGIC CRUSS SECTION - LATERAL





#### APPENDIX C

MONITORING WELL CONSTRUCTION LOGS





Date Date	Time	Вюмз/в"	Advanced/ Recovered	Sampte Number PIO (ppm)	Sample Interval USCS	Symbols	Lithologic Description		Hell Construction Summary
- - - - 5 12/11	1015	3 3 2		S-1 1	a CL		Sandy CLAY, little fine gravel, dark yellowish-brown, moist.  Silty, sandy CLAY, light olive brown, moist; glacial loess.	Sch. 10 PVC Casing	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
	1040	1 2 3 4	24"	S-2	7 \\ CL		Moderate yellowish-brown CLAY, moist, homogeneous: glacial loess.	\$c	e Seal
	1045	2 2 2 3	24" ! !	S-3	8 CL		Similar to sample S-2.	reen	Bentonite Seal
	1100	10 11 17	3 24" 0 3 7	S-4	6 <b>∑</b> S₩	//	Fine grained SAND, dark yellowish- orange to yellowish-gray, slightly moist; glacial till.	010 Slotted Screen	Sand Pack
25 25	1110	, 2 3 3	B 24" (4 (0 12	S-5	8 <b>\</b> SW		Fine grained SAND, dark yellowish- orange, fina laminae, slightly moist; glacial till.	Â	
30 		1	6 24' 18 61 38	· 5-6	8 \\\SM		Fine grained, silty SAND.		
_ <del>_</del> 35			•						



Job Name Fort Des Moines Drill Method HSA 12/11/90 Date Started _ Date Completed __12/12/90 Casing Diameter  $\frac{4}{}$ 1140.002 Job Number _ 11.5'-26.5' Feet BEG USATHAMA 31.0 Feet BEG Total Depth . Client Name Screen Interval Location Des Moines, Iowa Water Level 26 Feet-BEG Slot Size 0.010 940.78 MSLD MW-I Boring Number _ Layne-Western Surface Elevation . Drilling Co. Michael P. Kubatz Signature

Signature

A-2

Date

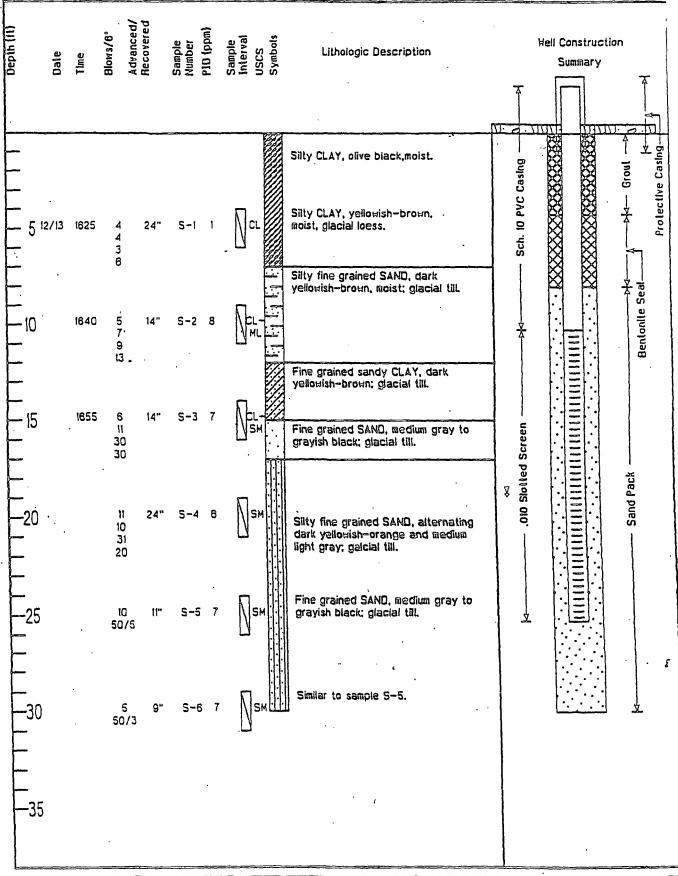


The second





Geologist .





Job Name Fort Des Moines	Date Started12/13/90	_Drill Hethod HSA
Job Number 1140.012	Date Completed12/14/90	Casing Diameter4
Client Name USATHAMA	Total Depth 30 Feet BEG	Screen Interval 10.25'-25.3' Feet BEG
Location Des Moines, Iowa	Water Level 18.75 Feet 8EG	_Slot Size0.010
Baring Number MW-3	Surface Elevation 928.23 MSLD	Drilling Co. Layne-Western
Geologist K.L. Dokken	Signature	Date

17.0 Feet BEG

Surface Elevation 923.60 MSLD

_ Hater Level

Signature

Slot Size __0.010

Drilling Co. Layne-Western



Client Name .

Boring Number . Geologist K.L. Dokken

Location _

Des Moines, Iowa

MW-4

		· -	<del></del>		· · · · · · · · · · · · · · · · · · ·		Page Lot
Date	Time Diagraphs	Advanced/ Recovered	Sample Number PIO (ppm)	Sample Interval USCS Symbols	Lithologic Description	<del>7</del>	Hell Construction Summary
	<del></del>				Sandy CLAY, fine grained, moist	Sch. 10 PVC C. Shing	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- - - 5 12/18 (	0630	3 18" 5 6 7	S-i 5		CLAY to sandy CLAY, fine grain light brown, with some yellowish brown, moist; glacial loess.	ed.	
- - -10 ' '	0845	3 24" 5 4 8	S-2 8		CLAY, trace sand, fine grained, moderate yellowish-brown, mois glacial till.	t:   →   Old Slot led Screen	
- - 15 -	0700	19 24" 30 18 30	S-3 8		Silty SAND, fine grained, dark yellowish—orange, moist, fine laminae; glacial till.	\$ 000	Sand Pack
	0845	8 24" 20 39 26	S-4 6	SH	Sandy CLAY, fine grained, dark yellowish-brown, moist. SAND, very fine to fine grained light brown to gray, moist: glacial till.	1 2	
_ _25 _	0935	15 16" 33 ' 50/4	S-5 6	S CL-	CLAY, trace sand, fine grained moderate yellowish-brown, moi glacial till.	st:	
<b>-</b> -					•		•
					. , ,		
 35							
1.5 11-	Fort F	)ės Moines		Date Ct	rted 12/18/90	Patrick - A	HSA
Job Name _ Job Number Client Name	1140	.012		Date Com	pleted 12/18/90 oth 25.4 Feet BEG	_Drill MethodCasing Diame Screen Inter	•
		ines, Iowa			vel 13 Feet BEG	_Slot Size0	

Date

Signature



Geologist K.L. Dokken

VERSAR, Inc. Log of Boring MW-6 Environmental Risk Management Sample Number PIO (ppm) Hell Construction Lithologic Description Summary Sch. 10 PVC Casing Protective Casing. Silty CLAY, moderate brown, 5 12/18 very soft, moist: glacial loess. Bentonite Seal-Sandy CLAY, fine grained pale 1625 / | CL yellowish-brown, moist; glacial .010 Slotted Screen Similar to sample S-2. |\|cr - 15 1635 Hole open over night. 1645 2 5 5 SAND, very fine to fine grained, grayish-black, slightly moist; 1715 19 50/2 glacial till. -35 12/18/90 Fort Des Maines HSA Date Started _ Job Name Drill Hethod _ Date Completed 12/19/90 1140.012 Job Number Casing Diameter USATHAMA 24.7 Feet BEG 8.1'-23.1' Feet BEG Total Depth

13 Feet BEG

940.66 MSLD

Water Level

Signature

Surface Elevation .

Screen Interval _

Slot Size 0.010

Drilling Co. _

Date

Layne-Western





Client Name

Location _

Boring Number .

Geologist K.L. Dokken

Des Moines, Iowa

MW-6

Environmental Risk Management

Log of Boring MW-7

► -Protective Casing

Client Name USATHAMA Location Des Moines, Iowa	Job Number	Job Name	35		77	777	1111111 8	வ	<del>5</del>	5 11/26	Oeplh (f
USATHAMA  Des Moines, Ic	i	Fort De				1020	0950	0900	0840	0805	Time Blows/6°
ES, IOWA	22	ort Des Moines				ហ្ម	== 0 B	ω 4 πυ το 4 4	- 000 ,	ພ ພ ພ ພ ເງ 4.	Advance Recover
						S	S 1 4	S-3	S - 2	\$ -! 0	Sample Number PID (ppm
Total Depth	Date Completed	Date Started				SX SA	SHANDER SHANDER	5 5	ь Б		Sample Interval USCS Symbols
25.		ed 11/26/91				Similar to sample S-4	Silty SAND, moderate yellowish- brown to yellowish-gray, mottled, fine to medium grained, subrounded quartz, moist; loess.	Silty CLAY, yellowish-brown, wet.	Similar to sample S-1, slightly moist.	CLAY, moderate yellowish- brown, maist; loess, ·	Lithologic Description
Screen I	Casing	Drill Method				٠	owish- mottled, brounded	, ±		1	ion
3 I I	<u>n</u>	thad HSA				<b>k</b> -		⇔ Slotled Screen -	→ M4	Sch. 10 PVC Casing	Hell o
8.5'-23.5' Feet BEG						11 		and Pack	Bentonite Se	· · · · · · · · · · · · · · · · · · ·	Hell Construction Summary

Date

Signature

Surface Elevation Water Level

943.13 MSLD

_Slot Size _

0.00

.Drilling Co.

Layne-Western

Boring Number

MH-7

Location Des Moines, Iowa

Log of Boring MW-8 Environmental Risk Management Page 1 of 1 Advanced/ Recovered Hell Construction Lithologic Description Summary Sch. 10 PVC Casing Protective Casing-Silty CLAY, moderate yellowish brown, and dark with some gravel, coarse 5 11/26 1635 yellowish-orange grained, slightly moist; loess. Bentonile Seal-Silty CLAY, dark yellow-1645 brown, gravel; loess. ℧ .010 Stolled Screen CLAY, dark yellow-brown, 15 1650 Het. Sand Pack Sandy CLAY, moderately reddish-// cr 11/27 0720 brown to very pale orange mottled, with sand lenses, fine grained, wet. 78 Clayey SILT, dark orange to very pale 0745 orange mottled, moist; glacial till. 8 15 12 -35 Date Started 11/26/91 Fort Des Moines HSA Job Name Drill Hethod . Date Completed __11/27/91 1140.012 Job Number Casing Diameter . USATHAMA 26 Feet BEG 8.5'-23.5' Feet BEG Total Depth _ Client Name Screen Interval _ Location Des Moines, Iowa 14 Feet BEG Slot Size __0.010 . Hater Level . Drilling Co. Layne-Western Surface Elevation 942.10 MSLD MM-B Boring Number K.L. Dokken Geologist . Signature Date



VERSAR, Inc.





Date	e Ei	Вюмз/в"	Advanced/ Recovered	Sample Number PIO (ppm)	Sample Intervat USCS Symbols	Lithologic Description	Hell Construction
- - - - - - - - - - - - - - - - - - -	0900	588	12"	S-1 0 S-2 0		CLAY, moderate yellowish-brown, soft, moist.  CLAY, moderate yellowish-brown, little silt.	
- - - - 15 -	0940		. 24"	· S-3 0	Oct.	CLAY, moderate yellow-brown, some silt, damp, light gray-brown and medium brown mottled clay.	
- -20 - - -	1000	24667	<b>,</b>	S-4 O	Car	Silty CLAY, moderate yellowish— brown, moist, and light gray clay mottling.	
-25 - - - - -30							
- - - -35	,	,			·		



Job Name Fort Des Moines	Date Started12/2/91	Drill HethodHSA
Job Number 1140.012	Date Completed12/2/91	Casing Diameter4
Client Name USATHAMA	Total Depth21.5 Feet BEG	Screen Interval 5.0'-20.0' Feet BEG
Location Des Moines, Iowa	Water Level !! Feet BEG -	Slot Size010
Boring Number MW-9	Surface Elevation 942.09 MSLD	Orilling Co. Layne-Western
Geologist K.L. Dokken	Signature	Oate

Log of Boring MW-10 Environmental Risk Management Blows/8" Hell Construction Lithologic Description Summary Profective Casho-Silty CLAY, dark yellowish-12/2 brown, moist; loess. Bentonile Seal-Silty CLAY, moderate yellowish-1500 brown, moist; loess. ·4 5 5 -CLAY, some silt, dark yellowish-15 1510 /|cr orange, moist: loess 010 Slotted Screen Sandy CLAY, fine grained, dark 1530 yellowish-orange, trace mica, moist; glacial till. SILT, trace send, fine grained, dark yellowish-orange, trace mica, NIML 1545 9 moist: glacial till. Refusal. Fort Des Moines 12/2/91 Job Name Date Started _ Drill Hethod Date Completed 12/3/91 1140.012 Job Number Casing Diameter . USATHAMA 28 Feet BEG 12.0'-27.0' Feet BEG Total Depth . Client Name Screen Interval. Des Moines, Iowa 17 Feet BEG Slot Size __0.010 Hater Level Surface Elevation 936.50 MSLD MM-10 Drilling Co. Layne-Western Boring Number



VERSAR, Inc.





K.L. Dokken

Signature

Geologist .

VERSAR, Inc. Log of Boring MW-11 Environmental Risk Management Page 1 of 1 Advanced/ Recovered Вюнз/в. Hell Construction Lithologic Description Summary Sch. 10 PVC Casi Silty CLAY, yellowish-brown, 5 12/3 1300 CL moist: loess. Bentonite Seal-Silty SAND, yellowish-brown, very 1320 5-2 0 MLfine to fine grained, dark yellow-10 orange mottled, slightly moist. 10 12 . Slatted Screen Sand Pack SILT to silty sand, very fine to fine grained, grayish black, very light gray and moderate yellowish-brown, 15 1335 ML-5-3 0 9 wet; glacial till. 20 Similar to sample 5-3, but with 1350 8 13 14 17 trace clay. -35 Fort Des Moines 12/3/91 HSA Date Started Job Name Drill Hethod 1140.012 12/3/91 Date Completed . Job Number Casing Diameter



ij)

USATHAMA

Des Moines, Iowa

MW-II

K.L. Dokken

Client Name

Boring Number

Location .

Geologist

Total Depth .

Water Level

Signature

Surface Elevation _

24 Feet BEG

14 Feet BEG

922.56 MSLD

7.0'-22.0' Feet BEG

Screen Interval

Slot Size _

Date .

0.010

Drilling Co. Layne-Western

VERSAR, Inc. Log of Boring MW-12 Environmental Risk Management Sample Number PID (ppm) Blows/8° Well Construction Lithologic Description Summary Sch. 10 PVC Cap CLAY, some silt, brownish-black trace gravel, subrounded, high 12/4 1125 CL organic content, moist. Bentonile Seal-CLAY with some silt, saturated with light gray mottling. 1150 saturated .010 Slotted Screen Sand Pack / cr Silty CLAY, dark yellowishbrown, saturated. -35 Fort Des Moines 12/4/91 HSA Date Started . Orill Hethod . Job Name . Date Completed 12/4/91 1140.012 Job Number .. Casing Diameter _ 6.0'-21.0' Feet BEG USATHAMA Total Depth . 22 Feet BEG Client Name Screen Interval _ Des Moines, Iowa 10.8 Feet BEG Slat Size __0.010 . Hater Level _ Location _

942.24 MSLD

Surface Elevation _

A-12

Signature .

Layne-Western

Drilling Co. _

Date



MW-12

K.L. Dokken

Boring Number

Geologist .

VERSAR, Inc. Log of Boring MW-13 Environmental Risk Management **Well Construction** Lithologic Description Summary Sch. 10 PYC Protective Casing-CLAY, some silt, moderately 12/4 1700 yellowish-brown, some rust Bentonile Sealstaining, moist. ℷ CLAY with some silt, yellowish-brown and light gray mottled. 12/5 0900 010 Slotted Screen some rust staining, wet. 2 . Silty CLAY, moderately yellowish-15 0930 5-3 0 brown with light gray mottling, moist. CLAY, some silt, light gray, slightly moist, some rust staining, moist. -35 12/4/91 Fort Des Moines Date Started . Drill Hethod . Job Name

Date Completed 12/5/91

Total Depth

Signature

21.4 Feet BEG

8 Feet BEG

Surface Elevation 944.60 MSLD

Casing Diameter .

Screen Interval

Slot Size

Drilling Co.

Date

5.0'-20.0' Feet BEG

Layne-Western





1140,012

K.L. Dokken

USATHAMA

Des Moines. Iowa

MW-13

Job Number

Client Name

Location _

Geologist .

Boring Number

Date Completed 12/5/91

Total Depth

Hater Level

Signature

Surface Elevation _

22.2 Feet BEG

952.03 MSLD

13 Feet BEG

Casing Diameter

Screen Interval _

Slot Size _

Drilling Co.

Date

0.010

Layne-Western

5.83'-20.83' Feet BEG





1140.012

K.L. Dokken

**USATHAMA** 

Des Moines, Iowa

MW-14

Job Number

Client Name

Boring Number

Location

Geologist .

Advanced/ Recovered PIO (ppm) Hell Construction Lithologic Description Summary Protective Casing-SS-1 0 Brown CLAY, some rust staining, some light gray mottling, very soft, very maist. Sch. 10 PVC Casing 2 SS-2 0 Light brownish gray, sifty CLAY, some rust staining, firm, slightly moist. SS-3 NH 3 4 7 9 Very dark gray grading to light (MAL) gray CLAY, some silt, stiff, slightly moist. Brown clayey silt along fractures. ţ 35810 S5-4 NW Brownish yellow, sandy CLAY, fine to coarse sand light gray (MAL) mottling, trace subangular gravel (feldspar and diorite), rust staining, stiff, wet. 55-5 NW Interbedded light gray CLAY, 14 (MAL) Bentonite Seal and clayey SILT, moist. 20 Yellowish brown clayey SILT with some fine sand, very moist. Sand Pack 11 55-6 NW Yellowish brown SILT and very 20/6" fine sand, micaceous, moist. Brown SILT with fine sand, laminae, micaceous, moist.



Job Name Fort Des Moines	Date Started 10/5/92	Drill Hethod HSA
Job Number 1140.014	Date Completed10/6/92	Casing Diameter4
Client Name USATHAMA	Total Depth49 Feet BEG	Screen Interval 30.0'-40.0' Feet BEG
Location Des Moines, Iowa	Hater Level 21 Feet BEG	Slot Size 0.020
Boring Number MW-14 D	Surface Elevation951.72 MSLD	Drilling Co. Layne-Western
Geologist Janice Smith-Bagheri	Signature	Date

Log of Boring MW-14 D VERDAM, INC. Environmental Risk Management Advanced/ Recovered Sample Number PIO (ppm) Blows/8° Hell Construction Lithologic Description Dale Summary 1.010 Slotted Screer 30/6" 6" SS-7 NW Yellowish brown SILT with very .. (MAL) fine sand, micaceous, dry. SS-8 0 Interbedded dark grayish brown, dark gray and light gray clayey SILT, laminated, hard, dry. 30 50/4" SS-9 0 5510 0 40 10" Same as above, dry to 50/4" slightly moist.





Depth (11)	Date	Blows/8° Advanced/ Recovered	Sample Number PIO (ppm)	Sample Interval USCS Symbols	Lithologic Description	·	Hell Construction Summary
12.	/6	Pushed 18" Pushed 18"	S-1 S-2 S-3	CH CL	CLAY, some silt, brownish black, slightly moist.  Silty CLAY, moderate brown, with gray mottling, slightly moist.  Similar to sample S-2.	Ţ	Bentonile Seal
— 10 — 15							
20 							
30  							



12/6/91 Fort Des Moines Date Started . .Drill Hethod _ SF A Job Name _ Job Number ______1140.012 .Date Completed <u>12/6/91</u> .Casing Diameter <u>NA</u> USATHAMA Total Depth 9 Feet BEG NA Feet BEG Screen Interval Location Des Moines, Iowa Hater Level 4.5 Feet BEG Slot Size NA Boring Number 8H-15 Surface Elevation NO MSLD Drilling Co. Layne-Western Geologist K.L. Dokken Signature Date



1))

Hater Level __ II Feet BEG

Surface Elevation ND MSLD

Screen Interval

Siot Size NA

Drilling Co. .

Date

Layne-Western

Total Depth

Signature

Des Moines, Iowa

K.L. Dokken

BH-16

Location _

Geologist _

Boring Number _

Log of Boring MW-17

Date Time Time Blows/8° Advanced/ Recovered Sample Number PID (ppm) Sample Interval USCS Symbols Oppus Symbols	Hell Construction Summary
Tellowish brown silty CLAY, and grayin forwar silty CLAY, and grayin forwar staining, sightly moist.  10 24" SS-2 NW (ATM) CH Same as above.  10 24" SS-3 5.0 CH Same as above.  15 4 SS-4 4.0 CH Silty CLAY, moist.  16" SS-4 4.0 CH Sight gray, silty CLAY, some fine sand, grading down to brown with light gray mottling, stiff, slightly moist.  18" SS-5 0 CL Yellowish brown, clayey silt and silty CLAY, some fine sand, grading down to brown with light gray mottling, stiff, slightly moist.  18" SS-5 0 CL Yellowish brown, clayey silt and silty CLAY, some fine sand, grading down to brown with light gray mottling, stiff, slightly moist.	Concrete Pad   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protective Casing   Protectiv



Fort Des Moines 10/8/92 Drill Hethod _ Date Started Job Name _ Date Completed 10/9/92 1140.014 Job Number Casing Diameter _ USATHAMA 23 Feet BEG 7.8'-22.8' Feet BEG Total Depth Client Name Screen Interval 15.3 Feet BEG Des.Moines, Iowa Slot Size __0.010 Water Level _ MW-17 Layne-Western Surface Elevation . Drilling Co. . Boring Number Janice Smith-Bagheri Signature Date

Depth (ft)	Date	Tine	Вюмз/в°	Advanced/ Recovered	Sample Number PID (ppm)	Sample Interval USCS	Symbols	Lithologic Description		워ell Construction Summary	
18	Dat		3 4 4 4 4 1 3 4 8 2 8 12 18 6 5 2	17" 16"	Sar Sar Num		NAS SAME SAME SAME SAME SAME SAME SAME SA	Topsoil  Dark brown, silty CLAY, little organic matter, to yellowish-brown silty CLAY, moist.  Brownish gray to orange silty CLAY, moist.  Light gray and orangish-brown mottled silty CLAY, moist.  Light brownish-gray to brown clayey SILT, moist.  Grayish-brown with a trace of light gray veins, clayey SILT, moist	⇔ .010 Slotted Screen Sch. 10 PVC Casing ——>		Protective Casing
30 	٠.	•	28 50/	3				Interbedded brown and light gray clayey SILT, trace black carbon, traces of organic matter, moist.  Boring terminated at 27.3 feet.			£



10/7/92 Fort Des Maines HSA Job Name _ Date Started . Drill Method _ Date Completed 10/7/92 1140,002 Job Number _ .Casing Diameter _ Total Depth 27.3 Feet BEG USATHAMA 11.45'-26.5' Feet BEG Client Name Screen Interval Location Des Moines, Iowa Hater Level 28 Feet BEG Slot Size 0.010 MW-18 928.59 MSLD Boring Number Surface Elevation Drilling Co. Layne-Western Geologist Michael P. Kubatz Date Signature

Date	Time	Advanced/ Recovered	Sample Number PID (ppm)	Sample Interval USCS Symbols	Lithologic Description	Well Construction Summary
- - -			<del></del>		CUTTING SAMPLES ONLY Yellowish brown silty CLAY moist to slightly moist some rust staining	** Sch. 40 PVC Casing >
- 5 ^{12/11}			CS-I NA	-	Yellowish brown silty CLAY soft, moist, trace fine sand Gray grading down to brownish gray silty CLAY, stiff grading down to firm, slightly moist, rust stains	
- - 10 - - -		•	CS-2 NA		Gray silty CLAY with some sand grading to silty caly, moist to slightly moist, firm to stiff staining increasing, trace coarse sand and gravel, distinct contacts	
- 15 - - - -		•	CS-3 NA		Brown silty CLAY with gray mottling slighly moist to dry, very stiff laminated mica, no sharp contacts Brown silty CLAY micaceous laminations, dry, hard, no sharp contacts	0.010 Slotted Screen
-20 - - - -		•	CS-4 NA		Brown laminated SILT, dry micaceous, hard	
-25 - - - -			·		-	
-30 - - - -						
<del>-</del> 35						



USATHAMA

085 18 E

J. Smith-Bagheri

Location Des Moines, Iowa

Client Name .

Geologist _

Boring Number _

. Water Level

Signature

.Surface Elevation .

22.2 Feet BEG

4.77 Feet BEG

928.77 MSLD

Screen Interval .

Slot Size _

Drilling Co.

	AR, Inc. onmenta		lanagemer	t		Log	of Bor	ing OBS	18 W
Date	Вюнз/6"	Advanced/ Recovered	Sample Number PID (ppm)	Sample Interval USCS Symbols	Lithologic Descriptio			Hell Construct Summary	
- 5 ^{12/11} - 10 - 15			NA NA		Due to proximity to MH-18 lithologic samples were not See MH-18 for lithographic Description	taken	4⊲ 0.010 Stotted Screen ———————————————————————————————————		Pentonite Seal → ► A- → F Grout
—20 — — — — —25	)		NA				*		*
 30     35	-			,					
Job Name <u>F</u> Job Number _				Date Star	ted 12/11/92 Dieted 12/11/92		Method HS	SA 4 1/4" [D . 2 in.	



17.

Client Name USATHAMA Total Depth 22.0 Feet BEG Screen Interval 6.1'-21.4 Feet BEG Location Des Moines, Iowa Water Level 4.22 Feet BEG Slot Size 0.010 928.31 MSLD 08S 18 W Drilling Co. Layne-Western .Surface Elevation _ Boring Number . Geologist J. Smith-Bagheri

4 00

Date

Signature



Signature

A-24

rod of Rolling WM-19 D



Environmental Risk Management





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Ε	Environmental Risk Management					Log of Boring MW-19		
	Date Time	Blows/6° Advanced/ Recovered	Sample Number PIO (ppm)	Sample Interval USCS Symbols	Lithologic Description		. Hell Construction Summary	
- - - - -40		40 12" 50/3" ,	55-7 0 0	ML	Very dark gray silty CLAY, laminated, dry.	•	K040 Stotted Screen —	
<del>-</del> <del>-</del>		20 14" 50/3"	SS-8 0 0	- ML	As above, very hard, dry.		▼   := :   · · · · ·     · · · · · ·   · · · ·	
-45  		60/0" 3"	SS-9	Ls H	Limestone fragments. Split spoon refusal	· :		
- -50 -						·		
-55 . - -								
					`			
					•			
-65 -								
_ _ 70								
_				·				
75				•				







Date	Time Blows/6*	Advanced/ Recovered	Sample Number PIO (ppm)	Sample Interval USCS Symbots	Lithologic Description	Well Construction Summary
					Dark yellowish-brown, moist.	Sasing ->-
. 5 ^{01/28}	5 4 7 9	. 14"	SS-I NA	- Cr	6" Dark brown (IOYR3/3), silty ( slightly moist, roots 6" Black (IOyr) silty CLAY, hard 2" Yellowish brown (IOYR5/6) sil CLAY, moist, soft, some gray mottling, black nodules	I dry
10	1 1 1 3	24"	SS-2 NA	D _{cr}	Yellow brown (IOYR5/8) silty CL very soft, moist, gray mottling, black nodules	
15	2 3 3 5	24"	SS-3 0	Cr	Gray silty CLAY, soft, wet, some rust staining	0.010 Slotted Screen
20 -	2 5 8 12		SS-4 0		Gray and strong brown (7.5YR5 silty CLAY, very stiff to hard, slightly moist	
-25 -	2 4 6 . 8		SS-5 0	Cr	Gray and strong brown (7.5YR) silty CLAY; some sand, firm to s slighty moist, 1 cm sand lens, st	atiff
- - -30	•					
- - -35					· .	
	Fort Des			Date Star		Drill Hethod HSA
Job Number Client Name Location	USATH	AMA		Total Dec	pleted 01/28/93 hth 25.5 Feet BEG rel 20.5 Feet BEG	Casing Diameter 4 in.  Screen Interval 8'-23' Feet BEG  Slot Size 0.010
Boring Numb			·	Surface E		Drilling Co. Layne-Western

Geologist J. Smith-Bagheri

Signature .

Date	Time Blows/8°	Advanced/ Recovered	Sample Number PIO (ppm)	Sample Interval USCS Symbols	Lithologic Description	Hell Constr	
·	·····		**************************************			N. a. 700	140.0
,					Dark brown clay, slightly moist	Sch. 40 PVC Casing  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Grout ->
5 01/28		1 18" 2 2 3	SS-1 0	. Ccl	Yellowish brown (10YR5/4) silty CLAY, slightly moist, firm grading down to soft some light gray mottling, some black nodules (areas or staining)		e Seal
10 .		1 24" 1 3 2 -	SS-2 NA	Ccr	Yellowish brown (10YR5/4) silty CLAY wet grading to moist some rust staining, grading down to pale brown (10YR), very soft	en	Bentonite Seal
15		3 .24" 7 11 14	SS-3 NA	Ccr	Yellowish brown (IOYR5/4) silty CLAY slightly moist, some gray (IO YR) mottling increasing at bottom of spoon, firm grading down to stiff	0.010 Slotted Screen	Sand Pack
20	·	2 20" 8 10 10	SS-4 0	Cr	Yellowish brown (10YR4/8) mottled gray (10YR8/1) silty CLAY with some fine to coarse sand, trace of gravel (subrounded), slightly moist	1 1 1.1=1.	
-25 -		6 24" 21 32 46	SS-5 0	ML	Yellow brown (10YR5/8) silt, some micaceous laminations, upper 2° gray, clayey in upper 6°, dry		
- - - -30		·					
- - - -35		·					



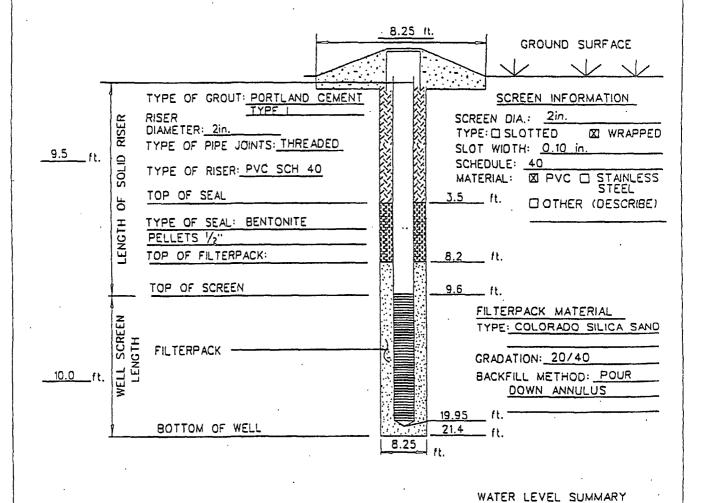
Job Name Fort Des Moines	Date Started 01/28/93	Drill Method HSA 6 1/4" ID
Job Number <u>1140.002</u>	Date Completed 01/28/93	Casing Diameter 4 in.
Client Name USATHAMA	Total Depth 24.1 Feet BEG	Screen Interval 8'-23' Feet BEG
	Water Level 22.3 Feet BEG	Slot Size 0.010
	Surface Elevation MSLD	Drilling CoLayne-Western
Geologist <u>J. Smith-Bagheri</u>	Signature	Oate



HOLE NO. (as shown on drawing title and file number) MW96-01			PROJECT FT. DES MOINES BLDG, 67		
DATE INSTALLED	STARTED 7-22-96	COMPLETED 7-25-96	LOCATION (Coordinates or Station)		
ELEVATION TOP OF HOLE			SIGNATURE OF INSPECTOR/INSTALLER CAROLYN SCHWAFEL		
TOTAL DEPTH OF HOLE 21.4'			ELEVATION GROUND WATER (or depth from surface) 10.74' TOC		

### FLUSH MOUNT WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)







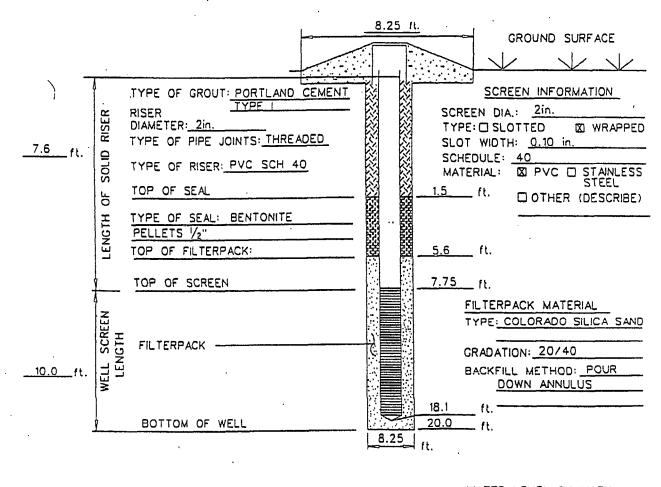
WATER LEVEL MEASUREMENTS

DATE/TIME/LEVEL 7/24/96/0805/10.74'

HOLE NO. (as shown on dra title and file numb	wing er) MW96-02		PROJECT FT. DES MOINES BLDG. 67		
DATE INSTALLED .	5TARTED 7-19-96	7-25-96	LOCATION (Coordinates or Station)		
ELEVATION TOP OF HOLE			SIGNATURE OF INSPECTOR/INSTALLER CAROLYN SCHWAFEL		
TOTAL DEPTH OF HOLE 20.0'			ELEVATION GROUND WATER (or depth from surface) 13.78' TOC		

### FLUSH MOUNT WELL CONSTRUCTION DIAGRAM

(ALL MEASUREMENTS FROM GROUND SURFACE)



WATER LEVEL SUMMARY

WATER LEVEL MEASUREMENTS DATE/TIME/LEVEL 7/24/96/0900/13.78'



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# APPENDIX D RECORDS OF COMMUNICATION







Memo: Conversation with Mr. Dennis Myers of USACE Omaha District regarding Fort Des Moines

From: Greg Dixon

To: File

Date: Nov. 5, 2002

Mr. Myers said:

1. He would try to locate the full 1st and 4th Quarterly Monitoring Reports from Cape Environmental and send it to me.

2. A ROD was never issued for the FUDS side. The state and EPA both seemed pleased with the direction and efforts completed by the Corps and basically said that nothing else need be done. For that reason, the process did not progress beyond the Decision Document that we have.







Memo: Conversation with Mr. Robert Koke of EPA regarding Fort Des Moines

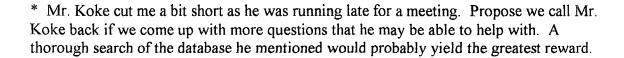
From: Greg Dixon

To: File

Date: Nov. 5, 2002

Mr. Koke said:

- 1. He had an imperfect memory of the site but did recall BRAC and FUDS sides and also knew that Dave Packard was the USACE POC.
- 2. Mr. Koke said he received many documents related to this project, but at the time EPA was NOT in a position to respond to all of it. Mr. Koke also said that as a non-NPL site, FDM was not considered a high priority site. Bottom line, some things were commented on and others were not and he couldn't recall off-hand what EPA had provided response and guidance on.
- 3. Mr. Koke said that the EPA would not get involved with well closures and that any activities along those lines should be coordinated with state officials.
- 4. Mr. Koke vaguely alluded to a database that we could check to see the current regulatory status of projects as far as EPA is concerned (informed). Joe Fleming, formerly with JMWA, mentioned this site in a memo that he wrote up after speaking with Ms. Diane Bailey, who is Mr. Koke's alternate POC.









Memo: Conversation with Mr. Dan Cook of Iowa Department of Natural Resources

From: Greg Dixon

To: File

Date: Nov. 13, 2002

Mr. Cook said:

1. EPA is the lead agency at the site, not the State of Iowa.

- 2. He was aware that FDM was not on the NPL, but CERCLA rules were being used as the clean-up standards for the property.
- 3. It is the EPA that would give permission to close any of the wells since they are the lead agency but whomever closes the wells should follow State of Iowa guidelines, which can be found in IAC 567 Chapter 39: Requirements for Properly Plugging Abandoned Wells.
- 4. Since this was an Army site, USACE oversaw the work being done, which is consistent with what Mr. Cook is familiar with.
- 5. He attends semi-annual FUDs meetings where FDM is briefly discussed. The site is only talked about in passing now and is a NON-ISSUE AS FAR AS THE STATE IS CONCERNED.
- 6. The EPA has sent the state many copious amounts of documents regarding the cleanup actions that have taken place at FDM. However, Mr. Cook is not aware of a ROD being completed.
- 7. Gave me an EPA contact for Diane Bailey who subsequently directed me to Mr. Robert Koke whom I spoke with last week.

**Note: Mr. Cook's Phone Number is (515) 281-4171.







Memo: Conversation with Mr. Dennis Myers of USACE Omaha District regarding Fort

Des Moines

From: Greg Dixon

To: File

Date: Nov. 14, 2002

Mr. Myers said:

The sewer pipe on the side of the FUDS investigation was removed. That action was completed at the same time of the soil removal action at footprint of Former Building 67.







Memo: Conversation with Lambert Nnadi of Iowa DNR regarding FDM

From: Erich Sonnenberg

To: File

Date: Nov. 18, 2002

I asked Mr. Nnadi (phone 515-281-4117) what records they had regarding Fort Des Moines and what had to happen before the monitoring wells could be closed out.

### Mr. Nnadi said:

- 1. IDNR had the lead on the site up until completion of the PA/SI (Dec. 89). After that, EPA took over the Site and EPA IS CURRENTLY THE LEAD AGENCY. Because of this transfer, IDNR has records on the site up through the PA/SI and EPA has records after that point. Mr. Nnadi did not believe IDNR had the Administrative Record or the ROD. As far as the State is concerned, they are done with the Site.
- 2. As far as closure of the wells go, we need to get EPA's approval because they are the Lead agency (we do not need approval from IDNR). Once we get EPA's approval we need to get the IDNR Well Abandonment Forms and send them to the State after we have followed the State's Regs on well abandonment in *IAC* 567 Chapter 39. The forms should be returned to the Contaminated Sites Section, which is the group Lambert is in.







### Informal Memo

From: Erich Sonnenberg

To: File

Date: Nov. 21, 02

Subject: Conversation with Mr. Koke (EPA VII) regarding FDM

I spoke with Mr. Koke regarding any requirements for abandonment of Monitoring Wells at FDM. I told him that Iowa identified EPA as the Lead Agency and that any request for abandonment would have to go through EPA.

- 1. Mr. Koke said that since this was a non-NPL site, EPA did not have the Lead.
- 2. I asked him about a ROD and there is none.
- 3. He mentioned that he was only familiar with the BRAC portion of the site and he cannot speak as to any requirements for closing FUDS wells.
- 4. As for a request for abandonment of wells He said we do not need to make a request for well abandonment. He said is overwhelmed with other sites and would just as soon not hear from us. He said if we want to be thorough, we could send him a letter telling him that we are going to close the wells but he is not requesting this.







### Informal Memo

From: Greg Dixon

To: File

Date: April 4, 2003

Subject: Conversation with Mr. Kenny Ball, Blank Park Zoo

I spoke with Mr. Kenny Ball, who works with the Blank Park Zoo regarding some of the physical features of the ponds at the zoological park. Mr. Ball provided the following information:

- 1. The large pond, which is called the lagoon pond is approximately 7' at its deepest point. It is earthen not lined. The lagoon pond can accept water from the Blank Park Creek via a valve that is in place. However, that valve has never been opened and all waters from that channel are effectively routed around the zoo.
- 2. The next largest pond, the Australian Outback pond, is about 4' at its deepest point. It is earthen not lined.
- 3. The Flamingo pond that is indicated on our maps is no longer there. A new building sits on that site. A newer Flamingo pond does exist and is concrete lined, just as the sea lion pond is.



# APPENDIX E RISK-BASED CONCENTRATION CALCULATIONS

### Risk Calculations to Determine Action Levels for Groundwater



 $C = \frac{\mathbb{R} \mathbb{F} \times \mathbb{A} \mathbb{T} \times 365 \text{ days/year}}{\mathbb{A} \text{bs x } [(\mathbb{E} \mathbb{R}_c \times \mathbb{E} \mathbb{F}_c \times \mathbb{E} \mathbb{D}_c) / \mathbb{B} \mathbb{W}_c + (\mathbb{E} \mathbb{R}_a \times \mathbb{E} \mathbb{F}_a \times \mathbb{E} \mathbb{D}_a) / \mathbb{B} \mathbb{W}_a] \times \mathbb{C} \mathbb{F}}$ 

For DDD

For carcinogenic risk, RF = TR/SF

 $TR = 5 \times 10^{-6}$ 

SF = 0.24 (mg/kg)/day

AT = 70 years

Abs = 1

Erc = 1 L/day

Efc = 0 days/yr

Edc = 6 yrs

BWc = 15 kg

Era = 2 L/day

Efa= 365 days/yr

Eda = 70 yr

Bwa = 70 kg

CF = 1

 $C = \frac{5 \times 10^{-6} / 0.24 \text{ (mg/kg)} / \text{ av x 70 vrs x 365 day/vr}}{1 \times [(1 \text{ L/day}) \times 0 \text{ day/yr x 6 yr}) / 15 \text{ kg} + (2 \text{ L/day x 365 day/vr x 70 vr}) / 70 \text{ kg}] \times 1}$ 

 $\frac{0.53229 \text{ mg/kg}}{1 \text{ x } [(0) + (730\text{L/kg})] \text{ x } 1} = 0.000729 \text{ mg/L} = [0.720 \text{ g/L}]$ 

For DDE

For carcinogenic risk, RF = TR/SF

 $TR = 5 \times 10^{-6}$ 

SF = 0.34 (mg/kg)/day

AT = 70 years

Abs = 1

Erc = 1 L/day

Efc = 0 days/yr

Edc = 6 yrs

BWc = 15 kg

Era = 2 L/day

Efa= 365 days/yr

Eda = 70 yr

Bwa = 70 kg

CF = 1

 $C = \frac{5 \times 10^{-6} / 0.34 (mg/kg) / day \times 70 \text{ yrs } \times 365 \text{ day/yr}}{1 \times [(1 \text{ L/day}) \times 0 \text{ day/yr } \times 6 \text{ yr}) / 15 \text{ kg} + (2 \text{ L/day} \times 365 \text{ day/yr } \times 70 \text{ vr}) / 70 \text{ kg}] \times 1}$ 



### $\frac{0.37574 \text{ mg/kg}}{1 \text{ x } [(0) + (730\text{L/kg})] \text{ x } 1} = 0.000514 \text{ mg/L} = 0.514 \text{ ug/L}$

```
For DDT

For carcinogenic risk, RF = TR/SF

TR = 5 x 10<sup>-6</sup>

SF = 0.34 (mg/kg)/day

AT = 70 years

Abs = 1

Erc = 1 L/day

Efc = 0 days/yr

Edc = 6 yrs

BWc = 15 kg

Era = 2 L/day

Efa= 365 days/yr

Eda = 70 yr

Bwa = 70 kg

CF = 1
```

$$C = \frac{5 \times 10^{-6} / 0.34 \text{ (mg/kg)/day x 70 yrs x 365 day/yr}}{1 \times [(1 \text{ L/day}) \times 0 \text{ day/yr x 6 yr}) / 15 \text{ kg} + (2 \text{ L/day x 365 day/yr x 70 yr}) / 70 \text{ kg}] \times 1}$$

$$= \frac{0.37574 \text{ mg/kg}}{1 \times [(0) + (730 \text{L/kg})] \times 1} = 0.000514 \text{ mg/L} = 0.514 \text{ ug/L}$$

For DDT

For noncarcinogenic risk, RF = THQ x RfD
THQ = 0.02
RfD = 0.0005 mg/kg/day
AT = 70 years
Abs = 1
Erc = 1 L/day
Efc = 0 days/yr
Edc = 6 yrs
BWc = 15 kg
Era = 2 L/day
Efa= 365 days/yr
Eda = 70 yr
Bwa = 70 kg
CF = 1



 $C = \frac{0.02 \times 0.0005 \text{ (mg/kg)/day} \times 70 \text{ yrs } \times 365 \text{ day/yr}}{1 \times [(1 \text{ L/day}) \times 0 \text{ day/yr} \times 6 \text{ yr}) / 15 \text{ kg} + (2 \text{ L/day} \times 365 \text{ day/yr} \times 70 \text{ yr}) / 70 \text{ kg}] \times 1}$ 

= 
$$\frac{0.2555 \text{ mg/kg}}{1 \text{ x } [(0) + (730\text{L/kg})] \text{ x } 1}$$
 = 0.00035 mg/L =  $0.35 \text{ mg/L}$ 

For alpha BHC

For carcinogenic risk, RF = TR/SF

 $TR = 5 \times 10^{-6}$ 

SF = 6.3 (mg/kg)/day

AT = 70 years

Abs = 1

Erc = 1 L/day

Efc = 0 days/yr

Edc = 6 yrs

BWc = 15 kg

Era = 2 L/day

Efa= 365 days/yr

Eda = 70 yr

Bwa = 70 kg

CF = 1

 $C = \frac{5 \times 10^{-6} / 6.3 \text{ (mg/kg)/day x 70 yrs x 365 day/yr}}{1 \times [(1 \text{ L/day}) \times 0 \text{ day/yr x 6 yr}) / 15 \text{ kg} + (2 \text{ L/day x 365 day/yr x 70 yr}) / 70 \text{ kg}] \times 1}$ 

= 
$$\frac{0.02028 \text{ mg/kg}}{1 \text{ x } [(0) + (730\text{L/kg})] \text{ x } 1} = 0.0000278 \text{ mg/L} = 0.0000278 \text{ mg/L}$$

For beta BHC

For carcinogenic risk, RF = TR/SF

 $TR = 5 \times 10^{-6}$ 

SF = 1.8 (mg/kg)/day

AT = 70 years

Abs = 1

Erc = 1 L/day

Efc = 0 days/yr

Edc = 6 yrs

BWc = 15 kg

Era = 2 L/day

Efa= 365 days/yr

Eda = 70 yr

Bwa = 70 kg

CF = 1

$$C = \frac{5 \times 10^{-6} / 1.8 (mg/kg) / day \times 70 \text{ yrs } \times 365 \text{ day/yr}}{1 \times [(1 \text{ L/day}) \times 0 \text{ day/yr} \times 6 \text{ yr}) / 15 \text{ kg} + (2 \text{ L/day} \times 365 \text{ day/yr} \times 70 \text{ yr}) / 70 \text{ kg}] \times 1}$$

$$\frac{0.07097 \text{ mg/kg}}{1 \text{ x } [(0) + (730\text{L/kg})] \text{ x } 1} = 0.0000972 \text{ mg/L} = 0.0000972 \text{ mg/L}$$

For delta BHC

For noncarcinogenic risk,  $RF = THQ \times RfD$ 

THQ = 0.02

RfD = 0.003 mg/kg/day

AT = 70 years

Abs = 1

Erc = 1 L/day

Efc = 0 days/yr

Edc = 6 yrs

BWc = 15 kg

Era = 2 L/day

Efa= 365 days/yr

Eda = 70 yr

Bwa = 70 kg

CF = 1



$$C = \frac{0.02 \times 0.0003 \text{ (mg/kg)/day} \times 70 \text{ yrs} \times 365 \text{ day/yr}}{1 \times [(1 \text{ L/day}) \times 0 \text{ day/yr} \times 6 \text{ yr}) / 15 \text{ kg} + (2 \text{ L/day} \times 365 \text{ day/yr} \times 70 \text{ yr}) / 70 \text{ kg}] \times 1}$$

$$= 0.1533 \text{ mg/kg} = 0.00021 \text{ mg/L} = 1 \text{ mg/L}$$

$$1 \text{ x } [(0) + (730 \text{L/kg})] \text{ x } 1$$



APPENDIX F

COST EXTIMATES



### Fort Des Moines Additional Monitoring Event

Survey and Sampling Item Labor	Number	Unit Cost	Cost
Program Manager	10	\$72.41	\$724.10
Env. Scientist	60	\$47.37	\$2,842.20
Technician	48	\$32.35	\$1,552.80
Draftsperson	4	\$22.16	\$88.64
Word Processor	4	\$21.96	\$87.84
	126		\$5,295.58
Subcontractor			
Analytical Services	13	\$300.00	\$3,900.00
Other Direct Costs			
Travel	2	\$1,150.00	\$2,300.00
Equipment	1	\$570.00	\$570.00
Reproduction	1	\$200.00	\$200.00
Shipping/mailing	1	\$150.00	\$150.00
			\$3,220.00
Total Cost			\$12,416







### **ASSUMPTIONS**

Fort Des Moines Additional Monitoring Event Assume Program Manager at 10 hrs.

### Well Survey and Sampling

Assume 1 technician and 1 Env. Scientist at 40 hrs. each to purge wells and collect samples (approx

## Analytical Services - Subcontractor VOC analysis at \$200/sample Pesticide analysis at \$100/sample

Car/truck rental at \$300 per week

### Equipment

Water Level Meter for 1 week for \$100 (includes shipping)
Magnotometer to locate wells for \$100 (includes shipping)
Sampling equipment (coolers, tape, baggies, etc.) for \$200
Poly bailers (8-4" per case)- 2 cases at \$85/case
Travel
Assume 2 RT airfare tickets at \$500 each = \$1,000
Per diem 2 people at \$100/day for 5 days

### Report

Assume 1 technician at 8 hrs. and 1 Env. Scientist at 20 hrs. Assume 1 draftsperson at 4 hrs. Assume 1 word processor at 4 hrs.

Report Production - Assume \$200
Sample Shipping and Fed Ex for \$150
Assume existing Work Plan and HASP may be used.





### Fort Des Moines Abandon Monitoring Wells

ltem	Number	Unit Cost	Cost
Labor			
Program Manager	10	\$72.41	\$724.10
Env. Engineer	74	\$49.94	\$3,695.56
Word Processor	4	\$21.96	\$87.84
	88		\$4,507.50
Subcontractor			
Well Abandonment	29	\$340.00	\$9,860.00
Other Direct Costs			
Travel	1	\$1,300.00	\$1,300.00
Equipment	1	\$600.00	\$600.00
Reproduction	1	\$200.00	\$200.00
Shipping/mailing	1	\$50.00	\$50.00
			\$2,150.00
Drum Disposal			
Haz Waste	5	\$200.00	\$1,000.00
Total Cost			\$17,518







### **ASSUMPTIONS**

Fort Des Moines
Well Closure Activities
Assume Program Manager at 10 hrs.

### Oversight of Well Abandonment

Assuming abandonment of 6 wells/day, it would take 29wells/6 = 5 days Assume one Env. Engr. for 5 days plus travel or 50 hrs. incl. travel.

### Well Abandonment - Subcontractor

Assume \$500 for Mob/Demob Remove either stickup or flush mount cover assume \$75 each  $\times$  29 = \$2,175 Remove bollards at \$25/bollard  $\times$  80 bollards(assumed) = \$2,000 Grout Backfill wells at \$4/LF for 4" well  $\times$  800 LF = \$3,200 Neat cement or concrete tops (upper 4 feet) at \$50/well = \$1450 Place debris in 55 gal drums at \$50/drum  $\times$  10 drums = \$500. Total = \$9,825

OR

Based on similar work at Irwin Launch site- \$310/well x 29 wells = \$8,979.

### Equipment

Water Level Meter for 1 week for \$100 (includes shipping) PID at \$100/day for 5 days

#### Trave



Assume 1 RT airfare tickets at \$500 each = \$500 Per diem 1 people at \$100/day for 5 days = \$500 Car/truck rental at \$300 per week

### Report/Well Abandonment forms

Assume 1 Env. Eng. at 24 hrs. Assume 1 word processor at 4 hrs.

Report Production - Assume \$200 Fed Ex at \$50

### **Disposal of Drums**

Assume 5 drums x \$200 = \$1,000 Lab Anal 1 sample x \$500 = \$500 Assume existing Work Plan and HASP may be used.

